COMMERCIAL FISHERIES
ABSTRACTS

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

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UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

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0.110 (*) SENSORY LABORATORY TESTING FACILITIES

Trinchese, Toni (Chemurgy Division, Central Soya Co., Chicago, Illinois)
Food Product Development 2, No. 2, 72-74 (April-May 1968)

Sensory evaluation is important at all levels of product development, from the initial laboratory test to the final test on the consumer. Laboratory tests permit close control of the test situation and use of techniques not practical at the consumer-testing level. Broad consumer tests provide a general overall judgment of the product, whereas tests by a small, trained, laboratory panel isolate troublesome characteristics and give direction to product improvement. At the laboratory level, a product may be given sensitivity, difference-similarity, quality, descriptive or analytical, preference, or acceptability tests. Although these tests cannot duplicate consumer tests, evidence indicates that data from laboratory preference-acceptability panels generally agree with large consumer tests in direction if not in magnitude. It is therefore practical and valid to conduct many types of tests at the laboratory level (except those large-scale tests that take into account all geographic, sociological, and other behavioral factors that influence product acceptability and that can be adequately studied only with appropriate sampling techniques).

Information about the design of and equipment for laboratory-testing areas is not readily available, even from several sources. Therefore this journal plans to issue a series of articles concerned with ideas for these facilities. They will deal with layout and design, lighting, air systems, food-preparation

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 ABSTRACTER: L. Baldwin

0.36 (*) FUNDAMENTAL STUDIES ON THE TRANSPORT OF SUBSTANCES ACROSS BIOLOGICAL MEMBRANES. III - ON THE ANOMALOUS OSMOSIS THROUGH MIXED MEMBRANES RECONSTRUCTED WITH CEPHALIN AND CHOLESTEROL

Shiratori, Masa, Haruo Mizuno, Masanori Okamoto, and Yatuhiro Tabata (Tokyo Univ. of Fisheries, Konan, Minatoku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 10, 975-978 (October 1967)

In 1966, the authors studied the anomalous osmosis of certain salt and acid solutions through cephalin and cholesterol membranes. In the present paper, they report on the anomalous osmosis of different salt and acid solutions through mixed membranes constructed with cephalin and cholesterol, and they compare the findings with those from the previous study.

Anomalous positive osmosis of potassium chloride, potassium sulfate, potassium citrate, sodium chloride, sodium glutamate, sulfuric acid, and acetic acid was smaller through the mixed membrane than it was through the cephalin membrane. The anomalous osmosis of magnesium sulfate, hydrochloric acid, L-glutamic acid, and glycine was negative through the mixed membrane but positive through the cephalin membrane. Negative anomalous osmosis of calcium chloride and magnesium chloride was of about the same order through both the cephalin and the mixed membranes.

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 ABSTRACTER: L. Baldwin

0.116 SUGGESTIONS FOR THE STANDARDISATION OF PROCEDURES AND TERMINOLOGY OF THIN-LAYER CHROMATOGRAPHY. INTRODUCTORY PAPER

Stahl, Egon (Institute of Pharmacognosy and Analytical Phytochemistry, University of Saarland, Saarbrücken, Germany)
Journal of Chromatography 33, No. 2, 273-279 (March 1968)

The author's premise is that the acceptability and increasing use of TLC - (thin-layer chromatography) necessitate the revision of previous standardization proposals and terminology to avoid the consequence of procedural errors and misinterpretations. Developments of the technique, additional experience, and changes in terminology must be taken into account.

As a rule, detailed data are necessary in TLC to allow comparison of operating conditions so that results can be evaluated and relevant conclusions drawn. The required data concern stationary phase, mobile phase, and procedural and environmental conditions. The R_F values, separations, and data on the detection of certain substances by TLC have a scientific value only if an exact description of the experimental conditions is presented in such a manner that the experiments can be repeated in another laboratory. Thus, the use of standardized conditions is of value in the comparison of results. If work is conducted according to such standardized procedures, it is sufficient to mention them; a description of experimental details can be omitted. If it is not possible to work under standard conditions, it is sufficient to mention any deviations. The author stresses that standard conditions do not restrict the analyst--they merely simplify the use of the method and make the results amenable to data processing.

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 ABSTRACTER: M. F. Tripple

2.02 (*) STUDIES ON THE PROPERTIES OF FISH ACTOMYOSIN. IV - EFFECT OF LECITHIN ON THE ATPASE ACTIVITY OF ACTOMYOSIN FROM FISH MUSCLE

Taguchi, Takeshi (Tokyo University of Fisheries, Minato-ku, Tokyo, Japan), and Shizunori Ikeda (Department of Fisheries, Kyoto University, Maizuru, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 5, 411-414 (May 1968) (In English)

In previous investigations by the authors (1967 and 1968), they found that the preparation of actomyosin from fish muscle contained lecithin. In the present investigation, the effect of lecithin on the ATPase (adenosine triphosphatase) activity of the actomyosin was studied to assess the biochemical role of the lipid.

When lecithin was added to the actomyosin, the ATPase activity increased with the amount of added lecithin. This suggested the possibility of direct participation of lecithin in the activity of ATPase. The correlation between the ATPase activity and the disappearance of lecithin from the actomyosin was then investigated by treating the actomyosin with phospholipase C. The ATPase activity of the actomyosin treated with phospholipase C decreased, and there was an accompanying breakdown of lecithin. The reactivating effect of lecithin on ATPase of the treated actomyosin increased rapidly in proportion to the amount of added lecithin. Because the ATPase activity of the treated actomyosin recovered completely when lecithin was added, the authors suggest that the lecithin of actomyosin plays an important role in activating the ATPase.

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 ABSTRACTER: M. F. Tripple

LABORATORY FACILITIES FOR SENSORY TESTING

STANDARDIZATION OF TLC PROCEDURES AND TERMINOLOGY

ANOMALOUS OSMOSIS THROUGH MIXED MEMBRANES

EFFECT OF LECITHIN ON FISH MUSCLE ACTOMYOSIN

0.116

A small portion of the table showing terms frequently used in chromatography, their application to given chromatographic techniques, and their definition appears below. A certain standardization of technical terms is desirable for international agreement. The first column of the table contains the English, German, and French terms related to TLC that the author thought were most desirable. The main criteria of their selection were that they be simple, comprehensive terms that are correct from both technical and linguistic standpoints and are already in common use. The second column gives the chromatographic techniques for which the terms are also valid. Simplified definitions of the terms are contained in the third column. The author hopes these definitions will facilitate introduction of the terms into dictionaries and encyclopedias. A fourth column, not shown, lists the synonymous terms used in the literature.

PROPOSED TERM	APPLICATION	DEFINITION
English: Adsorption chromatography German: Adsorptions-Chromatographie French: Chromatographie d'adsorption	Solid-liquid and liquid-liquid chromatography Paper chromatography Thin-layer chromatography Gas-liquid chromatography	Chromatographic separation based mainly on adsorption phenomena, as in classical chromatography on activated alumina using a nonpolar or weakly polar mobile phase.
English: To apply German: Auftragen French: Déposer	Thin-layer chromatography Paper chromatography	To apply the sample or standard solution to the starting point.
English: Chamber German: Kammer French: Cuve de développment	Paper chromatography Thin-layer chromatography	A vessel (having a lid that closes tightly) in which the chromatogram is developed.

0.110 (Cross References: 7.8, 8.8)

and -serving equipment, utensils, and special test procedures for particular products. Some of the points covered in the first of these articles follow.

Before making any plans about the type of testing environment desired, one should consider (1) the type of product or ingredient that will be evaluated and the type of investigation that will be most meaningful to the particular industry, (2) the amount of space available and the location of this space, (3) the amount of money in the budget for the facility.

A facility in which food is to be tested may have to serve a dual purpose--that is, it may have to accommodate booths for running tests with difference panels or rating panels or it may have to be set up with a table and chairs for descriptive-analytical tests. Lights used during each type of investigation should be controlled from separate switches so that lighting for the different types of test can be different.

Also discussed in this article are the importance of the number and position of the doors, the color and fabric of the draperies, the color of the paint on the wall, and the material of the furniture that the panelists use. The equipment in the experimental kitchen that adjoins the taste-panel room and how it is arranged is also described in detail.

U.S. Patent 3,313,795
Chemical Abstracts 67, No. 8, 36254h (August 21, 1967)

0.12 METHOD TO REMOVE PROTEINACEOUS MATERIALS FROM LIQUIDS

EQUIPMENT FOR REMOVING PROTEINS FROM WASTE WATER (U.S. PAT. 3,313,795)

2.02

The effect of added lecithin on the limiting concentration of ATP required for the dissociation of actomyosin was investigated to assess the role of lecithin in the interaction of actomyosin with ATP. The limiting concentration of ATP decreased when lecithin was added. The authors assume that when lecithin is added, the binding of myosin to actin becomes loose and the actomyosin becomes easily dissociated into myosin and actin in the presence of ATP.

The effect of lecithin on the dissociation constants of ATPase was investigated to further elucidate the loosening mechanism. The reaction rate was followed by varying only the concentration of ATP. The high concentration of ATP needed for ATPase to inhibit showed a reducing tendency when lecithin was added. It was evident that added lecithin acted as an allosteric effector by binding with the protein to increase the affinity of ATP to the actomyosin. The dissociation of actomyosin was easily observed when lecithin was added because the actomyosin was efficiently saturated with ATP, even at low concentrations of ATP. The authors suggest that the reaction of actomyosin with ATP might possibly be dependent upon the presence of lecithin. Lecithin might be important as a new factor in the biochemical role of actomyosin.

Ota, Fuyuo (Univ. Kagoshima, Japan)
Chemical Abstracts 64, No. 5, 7278e (February 28, 1966)

2.19 FORMATION OF TYRAMINE IN FISH AND SHELLFISH

FORMATION OF TYRAMINE IN FISH AND SHELLFISH

0.36

Anomalous osmosis of potassium chloride, sodium chloride, magnesium chloride, and sucrose was of the same order through mixed and cholesterol membranes, but that of potassium sulfate and potassium citrate was larger through the mixed membrane than through the cholesterol membrane.

From these results, the authors conclude that cholesterol is the major factor controlling the transport of water through cephalin membranes.

Hegsted, D. M., Raymond Neff, and Jane Worcester (Departments of Nutrition and Biostatistics, Harvard School of Public Health, Boston, Massachusetts 02115)
Journal of Agricultural and Food Chemistry 16, No. 2, 190-195 (March-April 1968)

The method for estimating the relative nutritive value of protein, in which the slope-ratio assay is used with young rats, has been described (Hegsted and Chang, 1965; Hegsted and Worcester, 1967). A computer program was written for easy evaluation of the validity and precision of the results obtained with the method. Comparisons of the results obtained with gain, body water, and body nitrogen as measures of response show generally similar results. Because of the ease with which body water may be determined, the authors selected it as the measure of choice. The relative precision that may be expected when six proteins are assayed, with different numbers of animals being used for each test protein, was determined. As few as nine animals per test protein, or three animals per group and three levels of each protein, will yield reasonably satisfactory results. [18 references] [Abstracter: M. F. Tripple]

0.321 DETERMINATION OF THE RELATIVE NUTRITIVE VALUE OF PROTEINS. FACTORS AFFECTING PRECISION AND VALIDITY

ESTIMATING NUTRITIVE VALUE OF PROTEIN

2.05 INCIDENCE OF CL. BOTULINUM TYPE E FROM THE PACIFIC COAST OF THE UNITED STATES

Eklund, M. W., and F. Poysky (U.S. Bureau of Commercial Fisheries, Seattle, Washington)
Proceedings of the International Association of Microbiological Society Botulism Conference, Moscow 1966, pp. 49-55 (1966)

Marine and fresh-water food products have been implicated in outbreaks of Type E botulism in the United States and Canada. Accordingly, the incidence of Clostridium botulinum in different fisheries is of concern. The object of this investigation was the distribution of C. botulinum in crab species and in marine and fresh-water sediments collected from the Pacific coast of the United States.

Incidence of Clostridium botulinum in crab.--The intestinal tract, gills, and shell from samples of the crab species Cancer magister collected at coastal areas of Alaska, Washington, Oregon, and California were examined. The incidence of C. botulinum was highest in crabs from the area of Ketchikan, Alaska (57 percent); Washington (61-75 percent); and northern Oregon (87 percent). Crabs collected in California had a much lower incidence rate of 12-30 percent. The types of C. botulinum isolated from the crabs were mainly Type E, although crabs from the Washington and Oregon coasts also contained Types A and B. Crabs collected from the coast of California contained Types A, B, C, and E. Type E was the most prevalent type in all samples. The Type B cultures all required trypsin activation to reach lethal levels of toxin for mice. The shell and gills were the body

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 ABSTRACTER: M. F. Tripple

2.05 SENSITIVITY OF AN ENRICHMENT CULTURE PROCEDURE FOR DETECTION OF CLOSTRIDIUM BOTULINUM TYPE E IN RAW AND SMOKED WHITEFISH CHUBS

Pace, Paul J., Henry J. Wisniewski, and Robert Angelotti (Milwaukee Health Department, Bureau of Laboratories, Milwaukee, Wisconsin 53202; and National Center for Urban and Industrial Health, U.S. Public Health Service, Cincinnati, Ohio 45226)
Applied Microbiology 16, No. 5, 673-679 (May 1968)

Introduction.--Previously reported data by the authors (Pace et al., 1966; 1967) clearly demonstrated the presence of Clostridium botulinum in whitefish chubs (Leucichthys sp.) collected from smoked-fish processors in the Milwaukee area. Various enrichment procedures were used and an attempt was made to evaluate these procedures qualitatively. The authors concluded that culturing the entire mass derived from ground fish was preferable to selecting a presumably representative 10-gram portion of the same material. They also concluded that the use of duplicate cultures prepared from about equal amounts of ground material--one exposed to an internal temperature of 60° C. for 15 min. (heat shocked) prior to being incubated and the other incubated without heat exposure (nonheat shocked)--yielded more positive cultures of C. botulinum than either method alone did.

Results of the previous investigations showed that C. botulinum was most prevalent in whitefish chubs at the processing stages prior to smoking. The

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 ABSTRACTER: M. F. Tripple

2.05 FISH: SEROLOGIC EVIDENCE OF INFECTION WITH HUMAN PATHOGENS

Janssen, Werner A. (Biological Sciences Laboratory, Fort Detrick, Frederick, Maryland), and Caldwell D. Meyers (Chesapeake Biological Laboratory, Natural Resources Institute, University of Maryland, Solomons)
Science 159, No. 3814, 547-548 (February 2, 1968)

The purpose of this investigation was to determine whether fish from surface waters that were subject to human fecal contamination were actively infected with the pathogenic bacteria normally associated with such contamination. Actively infected fish could serve as long-term active carriers of human disease, as well as short-term passive vectors. The authors made a serologic survey of serums from white perch (Roccus americanus) for antibodies to some of the human pathogens known to be introduced into the aquatic environment by excrement. The survey was based on the assumption that the existence in white perch of antibody to a particular human pathogen would be evidence that the fish had been actively infected with the pathogen or some closely related species at some time. Fish are known to produce highly specific antibody in response to antigenic stimuli. The assumption that active infection of fish is required to achieve an antigenic mass large enough to cause production of detectable antibody appeared reasonable in view of evidence that experimental injections of large amounts of antigens are required for such production in fish.

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 ABSTRACTER: M. F. Tripple

2.1121 (*) TOWING RESISTANCE OF TRAWLS

Poitier, Marcel (French Fisheries Research Institute)
World Fishing 17, No. 4, 28-29 (April 1968)

The balance of forces that exist in trawl gear being towed at a given speed is dependent on a number of factors--trawl, trawl doors, warps, and bridles. Changes in any one of these factors can affect the balance of the entire system, making it almost impossible to theoretically solve the geometrical problem of the gear. It is possible, however, to isolate one of the factors and to determine some of the possible effects it might have on the entire system. Thus, water flow through the trawl meshes and towing characteristics can be studied in relation to the mesh size and the extent to which the mesh is open or closed.

When comparing trawls it is important to ensure that the nets are of the same general shape. The practice of using different types of trawls alternately makes this method of comparison impractical when designing trawls for a vessel of specific engine power. It is more logical to take trawl resistance as a reference point. Trawl resistance depends on the shape of the trawl and the surface of the netting area because the resistance of the construction material opposes the flow of water that enters the mouth of the net. It can be shown mathematically how the "filtering power" of netting mesh is dependent upon two factors: (1) the diameter of the twine, which determines the side area of the total mesh,

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 ABSTRACTER: M. F. Tripple

CLOSTRIDIUM BOTULINUM TYPE E ON THE PACIFIC COAST

INFECTION OF FISH WITH HUMAN PATHOGENS

DETECTION OF CLOSTRIDIUM BOTULINUM IN WHITEFISH CHUBS

CALCULATING TOWING RESISTANCE OF TRAWLS

2.05 (Cross Reference: 9.15)

The agar-gel diffusion technique of Ouchterlony (1961) was used to detect precipitin antibody to the human pathogens Pasteurella pestis, P. pseudotuberculosis, Salmonella paratyphi A, Shigella flexneri, Proteus vulgaris, Pseudomonas aeruginosa, Escherichia coli B, Aeromonas hydrophila, and A. shigelloides.

Precipitin antibodies to each of the human pathogens were detected in fish taken near heavily populated areas. The precipitins were specific in that none of the positive serums reacted with more than one of the organisms with the exception that eight serums reacted with both P. pestis and P. pseudotuberculosis. These two species share most of their antigens, so cross-reactions with specific antiserums to either organism are to be expected. That the serums reacting with organisms other than P. pseudotuberculosis failed to cross-react with P. pestis is a further indication of the specific nature of the antibodies involved. The possibility that the precipitin bands may have been due to nonspecific reactions between antigens and serum lysozyme was ruled out by testing.

The detection in fish of antibodies to the bacteria that cause human pseudo tuberculosis, paratyphoid fever, bacillary dysentery, and a variety of chronic infections is viewed with alarm by the authors because the fish were taken from waters most likely to be contaminated with such bacteria. It is possible that the antigens were produced in response to infections with bacteria other than those tested; however, the close antigenic relations with the human pathogens tested make it likely that the organisms responsible were potentially dangerous to man. The possibility that fish may become active vectors of human disease as a result of their infection with pathogenic bacteria in contaminated water deserves more attention and study. [10 references]

2.1121

and (2) the open angle, which is the angle at the top of the diamond formed by the mesh. For a given dimension of mesh and a given angle of opening, the filter factor of a mesh will increase as the diameter of the twine decreases. This is why bottom trawls made of thick twines cannot attain the dimensions of pelagic trawls constructed of thin twine, which permits a high coefficient of filtration.

The author calculated the resistance of netting at various angles of mesh opening from 23° to 90° and at various angles of incidence to the line of tow. A plot of the calculations showed that resistance is lower for a small angle of incidence, as in the case of a long, tapered trawl. The plot also suggested that resistance increases as the mesh becomes more open. When the angle of incidence is high, the resistance will be at a maximum, whatever the opening of the mesh. At a small angle of incidence to the line of tow, the resistance can be trebled by opening the mesh from a top diamond angle of 23° to an angle of 90°. In practice, this would explain why pelagic nets, because of their elongated form, are able to have a reduced resistance while still retaining good water-filtration characteristics. Good water filtration will occur only if a large mesh size and small diameter twine are used. It would also explain why the size of the net that a given vessel can tow will vary according to the type of net.

2.118 RAPID PROGRESS IN THE TREATMENT OF FISH ON BOARD FACTORY SHIPS IN EAST GERMANY

Courtaud, F.

Rev. Conserve 24, No. 4, 86-88 (1968)

Food Science Abstracts 2, No. 8, Abstract No. 68/1085 (August 1968)

Some of the equipment on East German freezer trawlers is described briefly and illustrated.

2.05

areas most frequently contaminated with C. botulinum. The presence of the microorganism in the intestinal tract varied greatly; it was most frequently found when the tract was full of feed, but rarely found when the tract was empty.

Incidence of Clostridium botulinum in sediments.--Individual-core mud samples from the coastal areas of Washington, Oregon, and California were examined for incidence and types of C. botulinum. Type E was demonstrated in marine sediments collected along the Pacific coast from 49° to 36° N. latitude; only Types A, B, and F were found south of 36° N. latitude. The Type B cultures all required trypsin activation to reach lethal levels of toxin for mice. A strain of Type B was separated into pure culture. Type F was found on four occasions in marine sediments collected from the coasts of Oregon and California. One strain of Type F was separated into pure culture. Two of the demonstrations of Type F came from sediments collected at a depth of 1,646 meters, the third from a depth of 1,326 m., and the fourth from a depth of 235 m.

The concentration of C. botulinum Type E cells in marine and fresh-water sediments was expressed as MPN (Most Probable Number) per 100 grams of sediment. The MPN of marine sediments from Bellingham Bay, Washington, varied from 54 to 3,200 Type E cells per 100 g. of sediment. The MPN of fresh-water sediments from Lake Washington varied from 1,840 to 3,500 Type E cells per 100 g. of sediment.

The authors concluded that C. botulinum Type E is widely distributed among crabs and in marine and fresh-water sediments on the Pacific coast of the United States and that the incidence of C. botulinum decreases in the more southern areas of California.

2.05

organisms occurred in about 20 percent of 102 samples collected from a brine tank prior to smoking. Only 1 percent of 858 smoked-fish samples harbored C. botulinum. These prevalence data raised the question of whether the reported values represent minimal or actual contamination rates.

Experimental format.--An experimental format was designed to provide the following information: (1) the comparative efficiency of nonheat shock versus heat shock in the development of enrichment cultures containing toxin; (2) the minimum number of Type E spores that can be detected by the methods used; (3) the comparative efficiency of enrichment culturing as opposed to toxin extraction in detecting C. botulinum in stored whitefish chubs.

Results.--When the sensitivity of an enrichment-culture procedure for detecting C. botulinum Type E in whitefish chubs was tested, fish inoculated with 10 or more viable C. botulinum spores regularly developed specifically neutralizable enrichment cultures. Mild heat treatment at 60° C. for 15 min. substantially reduced the sensitivity of enrichment culturing. This effect was especially noticeable in the culturing of fish that harbored less than 10 spores per fish. The evidence indicated that the sensitivity of enrichment without heat approached the level of one spore per fish. Smoked whitefish chubs, which contained from one to several hundred spores per fish, were examined for toxin content after storage at 5°, 10°, 15°, and 28° C. for up to 32 days. The lowest temperature at which detectable toxin was produced was 15° C., and toxin was produced in 1 of 10 fish incubated at 15° C. for 14 days. C. botulinum was regularly recovered by enrichment culture from fish inoculated with small numbers of spores, whereas toxin was not detected by direct extraction of incubated fish. The persistence of C. botulinum Type E spores declined with an increase in the time and temperature at which the inoculated fish were stored. [10 references]

2.12 (*)

THE RELATION BETWEEN THE TRACES OF FISH SCHOOL RECORDED BY THE NET RECORDER AND THE CATCH OF TRAWL FISHING IN THE NORTHERN PACIFIC OCEAN

Kato, Masuo, and Shigeki Nonaka (Furuno Electric Co., Ltd., Towa Building, No. 5, 4-chome, Yaesu, Chuo-ku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 1, 49-58 (January 1968)

This report shows the relation between the size of fish schools entering a trawl net, as indicated by a net recorder, and the actual haul of fish. The data were gathered in the Northern Pacific Ocean bottom-fishing grounds.

The net recorder was a wireless, remote-controlled, fish finder used during bottom trawling. The signals of underwater information were conveyed by ultrasonic waves. The recorder consisted of a transmitter, a receiver, and indicator units. The transmitter unit was separated into two parts--the detector and the transmitter. The detector part was fixed on the head rope of the net; it emitted ultrasonic waves vertically and received back the signals that were fed to the transmitter part. The transmitter part was directed toward the fishing boat and emitted signals to a receiver towed by the boat. An indicator mounted on the bridge of the fishing boat recorded the signals on recording paper. On this paper, the height of the net mouth, the depth of the net, the quantity of fish entering the net, and the condition of the net were recorded.

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 ABSTRACTER: M. F. Tripple

2.12

SUBMARINE PHOTOS OF COMMERCIAL SHELLFISH OFF NORTHEASTERN UNITED STATES

Wigley, Roland L. (Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Massachusetts), and K. O. Emery (Woods Hole Oceanographic Institution, Woods Hole)
Commercial Fisheries Review 30, No. 4, 43-49 (March 1968) (Separate No. 810)

Several thousand photographs of the sea bottom off the northeastern coast of the United States were taken as part of a joint study by the Woods Hole Oceanographic Institution, the U.S. Bureau of Commercial Fisheries, and the U.S. Geological Survey. The photographs were made at 315 locations between Cape Hatteras, North Carolina, and the Gulf of Maine in water depths ranging from 2 to 1,810 fathoms. Single photographs were taken at 289 localities with a camera incorporated within a large clam-shell bottom sampler; at 26 other sites as many as 3,000 closely spaced photographs were made.

Nearly every photograph revealed the presence of animals living in or on the bottom. Of special interest were the commercially valuable mollusks--the sea scallop (Placopecten magellanicus Gmelin), surf clam (Spisula solidissima Dillwyn), and ocean quahog (Arctica islandica Linnaeus). The annual value of the combined fisheries for these mollusks is currently more than $16 million. Sea scallops are the most valuable species and account for 80 percent of the total value; surf clams constitute nearly 20 percent of the total, and ocean quahogs less than 1 percent.

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 ABSTRACTER: M. F. Tripple

3.26

THE PAPAL DECREE, KENNEDY ROUND PRESENT FISH STICKS, PORTIONS, WITH CHALLENGE

Schuler, Francis (Branch of Economic Research, Bureau of Commercial Fisheries)
Quick Frozen Foods 30, No. 9, 151-152, 188-189 (April 1968)

The author predicts that during the next 5 years the fish-stick and -portion industry will face two major challenges--(1) the full effect of the Catholic edict permitting meat-eating on Fridays (any significant effect produced by this change should become known during this time) and (2) the effect of the Kennedy Round agreements (full implementation of these agreements could mean an increase in competition from foreign producers for the U.S. market).

Although the full implications and effects of the repeal of the church edict are not fully known at the present, it is the consensus that the fish industry will be affected in some way. The effects will not be evenly distributed within the fish industry and the fish-stick and -portion segment of the industry may be the hardest hit. Frozen fish portions are mainly an institutional item, being well received on the Friday menus of institutions because of their convenience and portion control.

The latest available data give no clear indication of a declining demand for fish sticks and portions. Total production of sticks and portions in the first half of 1967 followed closely the 1966 level of production. Production of

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 ABSTRACTER: M. F. Tripple

3.27

PLANT THAWS FROZEN FISH BY VACUUM HEAT PROCESS

Anonymous
Fishing News International 7, No. 6, 48 (June 1968)

A British refrigeration-engineering firm is manufacturing a new type of fish-thawing plant, which uses a vacuum heat thawing (VHT) process and is fully automatic in operation. The company claims the plant is a fast, highly economical, low-priced thawing machine that eliminates the changes in color, odor, and flavor normally experienced with other thawing processes.

One reason for the development of the machine is the increase in the amount of fish being frozen at sea. In England, fish such as cod and haddock are caught and frozen whole in blocks of up to 100 pounds or are filleted, wrapped, and frozen in 7-lb. blocks. The frozen blocks of fish can be held in bulk and long-term storage against periods of short supply or to give continuity in factory lines. The practice of freezing, however, has created a need for machines to return the frozen product rapidly and in good condition to an ambient temperature. It is at the thawing stage that the benefits of freezing fish at sea are considerably reduced through the inherent disadvantages of the commercial thawing methods currently in use. These inherent disadvantages include the time taken to thaw the fish, discoloration and damage from oxidation caused by the presence of warm air, weight loss due to drying, high capital and operating costs, and partial cooking of the outside portions of the product by excess heat.

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 ABSTRACTER: M. F. Tripple

RELATION BETWEEN FISH NETTED AND FISH CAUGHT

SUBMARINE PHOTOS OF COMMERCIAL SHELLFISH

FUTURE OF THE FISH-STICK AND -PORTION INDUSTRY

VACUUM HEAT FISH-THAWING PROCESS

2.12 (Cross References: 1.82, 1.84)

Sea scallops.--Market-size scallops are usually 3½ to 6 inches in diameter (shell height). Scallops of this size live on the sea bottom and, as they are unattached, they are free to move about when disturbed. Because the scallops are clearly exposed to view, they are readily detected in photographs of the sea bottom. The photographs show that in relatively soft sandy bottoms, the sea scallops inhabit pockets or depressions. Where the sediment is compact, or composed of coarse materials, the pockets are small and shallow.

Surf clams.--Surf clams burrow into the sediment and position themselves so that the siphons are in contact with the overlying water. Thus, only the tips of the siphons are exposed and visible. No living surf clam shells were evident in the photographs; only shells of dead specimens were detected.

Ocean quahogs.--Ocean quahogs lie buried in sediment just below the water-sediment interface, in much the same position as the surf clams. Except for the siphons, quahogs are not visible above the surface. Consequently, the photographs reveal only shells of dead specimens.

Occurrence records from the photographs correspond closely with the distribution patterns for each species. All three species are restricted to the Continental Shelf, and their geographic distributions overlap considerably. The photographs may provide clues for more efficient methods of harvesting these species. [17 references]

3.27

In an attempt to overcome these difficulties, the firm developed the VHT process. The fish are placed in an enclosed chamber, most of the air is removed, and steam is injected into the partial vacuum and allowed to expand to a controlled maximum pressure. During the expansion, the temperature of the steam falls to a predetermined level to prevent heat damage to the fish. Because the steam condenses on all the cold surfaces of the fish, maximum possible heat is applied at a temperature the product can stand without damage.

Five basic advantages are claimed for the vacuum heat process. (1) The thawing time is the fastest possible. (2) Oxidation cannot occur because the process takes place in a vacuum; color, odor, and flavor changes caused by oxidation are eliminated. (3) There is no loss of weight from evaporation as the atmosphere within the thawing chamber will be water vapor. (4) Conditions within the thawing chamber prevent any damage due to partial cooking of the product. The amount of condensate applied to the surfaces is low, and leaching out of protein and other soluble nutrients is minimal. (5) The price of the equipment is comparatively low, and running costs are lower than with other methods.

Based on estimates of 1,250 tons of whole fish in 100-lb. blocks thawed at the rate of one-third of a ton per hour, the thawing costs of the method have been calculated at £2.5 a ton. For 4,000 tons of fish fillets, wrapped in wax paper and thawed at the rate of 1 ton per hour, thawing costs would be £1.9 a ton.

2.12 (Cross Reference: 2.116)

Actual trawls during which the net recorder was used were carried out by a large trawler near the Aleutian Islands and the southern part of Alaska. A large net with a net-mouth height of 5-6 meters and a net-mouth width of 30 meters was used. The operations reported were limited to those at depths of from 150 to 320 meters. The results were obtained by comparing the recordings displayed on the net recorder (showing the schools of fish that had entered the net) with the actual haul of fish.

The authors found that the recorder traces showing fish entering the net were about proportional in linearity to the haul of fish. Thus they could examine the recordings to determine the towing time required. They also found that when both rockfishes and Alaska pollack were 30 to 40 centimeters in total length, a school of Alaska pollack was twice as dense as a school of rockfish. Generally, the recordings of rockfishes and Alaska pollack were different in that rockfish cause sharp longitudinal traces that almost touch the oscillation line, whereas Alaska pollack cause densely horizontal semicircular traces on the bottom line.

3.26 (Cross Reference: 3.237, 9.2)

fish sticks declined by about 8 percent, whereas production of portions increased almost 7 percent. The net effect on total production was an increase of slightly over 1 percent, which indicates that processors have kept production close to the 1966 level.

With production remaining almost constant, consumption becomes the important variable. There is, however, no accurate measure of actual consumption. The closest estimate comes from monthly changes in cold-storage inventories of fish sticks and portions, plus the production of the month. The appropriation of consumption can be used in place of more reliable figures. Comparing the first 9 months of 1966 and 1967, the estimated increase in consumption was about 2.1 percent. Even allowing for population changes, consumption of fish sticks and portions appears to have increased slightly.

Another significant factor is that the average price of sticks and portions decreased in 1967. This creates a situation where consumption increased slightly but at a lower price. Suppliers were able to sell more only by offering their product at a reduced price. This fact must be kept in mind when drawing any conclusions about the net effect of the end of meatless Fridays on the demand for sticks and portions.

The possible effects of the agreements reached during the Kennedy round of trade negotiations on the stick and portion industry is an additional challenge facing the industry. Under the agreements, the artificial differences in price that the domestic producer enjoyed will be cut in half because the tariffs will be reduced by 50 percent. These changes are to be implemented over a 5-year period. Some effect on both supply and demand is anticipated. Fish sticks and portions are made from fish blocks, many of which are imported. The agreements could also mean that foreign producers will make the blocks and portions themselves.

2.118 THE CANNING FACTORY ON BOARD THE NATALIA-KOVSHOVA
(LA CONSERVERIE EMBARQUEE A BORD DU "NATALIA-KOVSHOVA")

Anonymous
Food Science Abstracts 1, No. 8, Abstract No. 67/1074 (August 1967)

The design of Russian factory trawlers that are capable of canning the fish as they are caught is described with illustrations and a diagram of the specifications. Three of these ships have been used for canning sardines, herring, and mackerel.

3.27 NEW METHOD OF THAWING FISH

Vedernikov, I. I. (Caspian Scientific Research Institute of Maritime Fisheries and Oceanography, U.S.S.R.)
Kholodil'naya Tekhnika 42, No. 3, 45-46 (1965) (Moscow, U.S.S.R.)

Experiments were conducted in thawing whole blocks of frozen Caspian sprats with a low-frequency, industrial, 50-cycle, alternating current. The thawing conditions, power expenditure, and contamination by the metal electrodes were determined.

An alternating current with a potential of 220 or 380 volts was connected to upper and lower electrodes immersed in a water bath. The electric circuit between the electrodes was closed by two layers of water and the frozen block. Insulating plates of polyvinyl chloride prevented contact between the electrodes and sprats separated from the main block. The flow of current through the block generated the heat needed for thawing. Uniform thawing was ensured by the presence of water layers, which formed a circuit of electrode→water→fish block→water→electrode at any spot between the electrodes. Uniform heating of the entire volume of the block was accomplished by heat exchange between the various parts of the block and the surrounding water.

A current of 35 amperes with a potential of 380 v. between the electrodes, a water temperature of 5° C., and a fish temperature of -4° to -5° C. were the
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 ABSTRACTER: M. F. Tripple

4.13 FATTY ACIDS AND OTHER COMPONENTS OF BALTIC HERRING FLESH LIPIDS

Linko, Reino R. (Department of Chemistry, University of Turku, Turku, Finland)
Turun Yliopiston Julkaisuja Annales Universitatis Turkuensis, Sarja-Series A, 1, 121 pp. (1967) Astronomica-Chemica-Physica-Mathematica (University of Turku, Turku, Finland)

The flesh lipids of the Baltic herring (Clupea harengus) were investigated. The total lipid content of the herring flesh averaged 4.0 percent and varied from 2.2 to 6.7 percent according to the season. The neutral lipid content of the flesh averaged 3.1 percent (77 percent of the total lipids) and varied the same as the total lipid content. The phospholipids averaged 0.9 percent of the flesh weight (23 percent of the total lipids) and varied from 0.5 to 1.5 percent. The triglycerides were the main components of the neutral lipids at 85 percent; they amounted to 3.65 percent of the flesh weight in winter and varied from 2.08 to 2.23 in other seasons.

The unsaponifiable matter represented 6.4 to 7.5 percent of the total lipids. Cholesterol accounted for 85 percent of the unsaponifiable matter; the remaining components were three unidentified subfractions and hydrocarbons, of which 30 percent was squalene, 18 percent was squalane, and about 50 percent included 41 other aliphatic hydrocarbons. The identified hydrocarbons included all even- and odd-numbered C_{15}-C_{30} n-alkanes.
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 ABSTRACTER: M. F. Tripple

4.13 (*) CHARACTERISTICS OF THE FATTY ACID COMPOSITION AND BIOCHEMISTRY OF SOME FRESH-WATER FISH OILS AND LIPIDS IN COMPARISON WITH MARINE OILS AND LIPIDS

Ackman, R. G. (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia)
Comparative Biochemistry and Physiology 22, pp. 907-922 (1967) (Pergamon Press Ltd.)

The fatty acids of the oils from four North American fresh-water fish have been examined by gas-liquid chromatography in connection with commercial meal and oil production (Ackman et al., 1967). Data from that research and other detailed data on oils and lipids from fresh-water fish were compared with recent data on two marine oils to ascertain basic differences between fresh-water and marine fish oils and lipids, particularly in depot fats. Fatty acid composition of oils from four North American fresh-water fish--sheepshead (Aplodinotus grunniens), tullibee (Coregonus artedii), maria (Lota lota), and alewife (Alosa pseudoharengus)--were compared with data for oils from two marine species--Atlantic herring (Clupea harengus) and cod (Gadus morhua).

The total C_{16} fatty acids were higher in the oils from the fresh-water fish than in oils from the marine species. The total C_{18} fatty acids were also higher; however, they were possibly less definitive as a means of distinguishing between fresh-water triglyceride oils and oils of marine origin.
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 ABSTRACTER: M. F. Tripple

4.13 THE FATTY ACID COMPOSITION OF EDIBLE MARINE FISH OILS

Khalid, Qamar, Ahmed Saeed Mirza, and A. Hameed Khan (Division of Biochemistry, Central Laboratory, Pakistan Council of Scientific and Industrial Research, Karachi, West Pakistan)
Journal of the American Oil Chemists' Society 45, No. 4, 247-249 (April 1968)

Because of the importance of fish oils as a natural source of highly unsaturated fatty acids, the present investigation was undertaken (1) to learn what fatty acids are found in the oils of edible marine fishes from the Karachi-Makran coast of West Pakistan and (2) to determine the variation in the pattern of these fatty acids in various species of fish.

The fatty acids present in the various fish oils have chain lengths from 10 to 24 carbon atoms and from 0 to 6 double bonds. The oils are rich in polyunsaturated acids, particularly the penta- and hexanoic acids. Percentages of certain of the major fatty acids vary widely among the fish species--myristic acid 2.3 to 13.7; palmitic 11.6 to 41.2; stearic 7.2 to 23.2; oleic 6.9 to 29.6; eicosapentanoic 1.4 to 19.0; docosapentanoic 0.to 10.2; and docosahexanoic 0 to 36.4. Linoleic and linolenic acids are present in small amounts in some of the oils, and arachidonic acid is present in all the oils.

In general, the content of saturated fatty acids is high as compared with those present in marine oils from colder regions. These differences are attributed to differences in the respective diets of these fishes and to the high
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 ABSTRACTER: M. F. Tripple

THAWING FISH WITH ELECTRICITY

COMPARISON OF FRESH-WATER AND MARINE FISH OILS

COMPONENTS OF BALTIC HERRING FLESH LIPIDS

FATTY ACID COMPOSITION OF PAKISTANI FISH OILS

4.13

Ratios among particular fatty acids and among various types of fatty acids were compared. Palmitic acid was about 60 percent of the total saturates in both fresh-water and marine oils. Total di- and tetraenoic acids were twice as high in the fresh-water oils as they were in the marine oils; total trienoic acids were three to four times as high. The author suggests that conversion of these fatty acids to the longer-chain fatty acids, such as 20:5ω3, 22:5ω3, and 22:6ω3 is not normally obligatory in fresh-water fish. The ratio of total linolenic to total linoleic types of acids was lower in the fresh-water oils, which suggested a basic difference in dietary availability of these two acids. [61 references]

4.13 CHOLESTEROL CONTENT OF HERRING OIL AS A SUPPLEMENT TO CHOLESTEROL ESTIMATION IN HERRINGS AND HERRING PRODUCTS

Wurziger, Johs., G. Hensel, and Bjoern Dagbjartsson (Hygienisch. Inst., Hamburg, Germany)
Chemical Abstracts 67, No. 25, 115892t (December 18, 1967)

4.13 POLYUNSATURATED FATTY ACID CONTENT IN THE FAT OF ATLANTIC HERRING

Petchatina, V. I. (Nauch. Issled Inst. Ryb. Khoz., Rigo, U.S.S.R.)
Chemical Abstracts 67, No. 5, 20731a (July 31, 1967)

3.27

starting conditions. The thawing process lasted 3 min., the final temperature of the water was 6.5° to 19° C., and the temperature of the thawed sprats was 0.4° to 3° C. The energy used was 0.12 kilowatt hours per kilogram of fish, and the maximum power was about 30 kw. The block disintegrated after thawing into separated fish of firm texture. The thawing process was regulated by altering the water supply; a rapid water flow lowered the temperature of the water, separated the electrodes from the block, and increased the thawing time. The thawing time with the 380-v. current was about half that needed with 220 v.

The thawed sprats were separated into two categories--first grade were sprats without bursting or mechanical injury that were suitable for the production of sardines, and second grade were those with bursting or mechanical injury that were suitable for other canned products. The results of thawing sprats by warm water and with an electric current are compared in the following table.

Average yield of sprats thawed							Average time to thaw with alternating current
In warm water			With alternating current				
1st grade	2nd grade	Waste	1st grade	2nd grade	Waste	Loss by cooking	
(%)	(%)	(%)	(%)	(%)	(%)	(%)	(minutes)
55.4	34.9	9.7	72.6	25.1	1.2	1.1	2.8

The average yield of first grade sprats after electric thawing was 17.2 percent higher than after thawing in water. The results of chemical analyses showed no changes in the basic indices of sprats after electric thawing. No heavy metals were detected, which meant no contamination by the electrodes.

4.13

temperatures of Pakistani waters. The effect of feeding habits on the fatty acid composition becomes apparent when the fatty acid composition of Hilsa (Clupea ilisha) and of black (Parastromateus niger) and white pomfrets (Stromateus sinensis) from Bombay and Karachi waters is compared. Although the composition differs markedly between the fish, it is noted that the amount of palmitic acid ($C_{16:0}$) in all three fishes is nearly the same. This particular fatty acid is evidently a key metabolite in fish in which the level of the fatty acid is relatively independent of diet.

Oils from catfish (Arius serratus), grey mullet (Mugil speigleri), and pomadasid (Pristipoma olivaceum) need special consideration as they differed markedly from other fish oils. Catfish oil consists of the highest amount of saturated acids at 56.4 percent and the least amount of polyunsaturated acids at 7.3 percent. The percentages of main constituents of the saturated acids are 41.2 palmitic acid and 11.8 stearic acid; the percentages of polyunsaturated acids are 4.5 arachidonic and 2.8 eicosapentaenoic. Of the total fatty acids, 92.7 percent are only saturated and monounsaturated. Among the monounsaturated acids, the predominant fatty acid is oleic at 29.6 percent. Thus, catfish oil has the highest percentage of palmitic and oleic acids. The body oil of grey mullet appears to be the best for nutrition. Oil from the grey mullet contains the following percentages: 40.3 saturated, 16.5 monounsaturated, and 43.2 polyunsaturated; the oil has all the essential fatty acids. Pomadasid oil contains all the essential fatty acids, and it is nearly as rich in saturated acids as catfish oil. The predominant saturated acids in pomadasid oil are palmitic and stearic at 23.2 percent each, and monounsaturated and polyunsaturated at 15.2 and 30.9 percent, respectively. [11 references]

4.13

The phospholipids averaged 56 percent phosphatidylcholines, 27 percent phosphatidylethanolamines, 7 percent phosphatidylinositols, 6 percent diphosphatidylglycerols, 2 percent sphingomyelins, and 2 percent unidentified phospholipids.

Three fatty acids isolated from the polyenoic acid fraction were identified as 5,8,11,14,17-eicosapentaenoic acid, 4,7,10,13,16,19-docosahexaenoic acid, both of which are common components of many fish oils, and cis-12,cis-15,cis-18,cis-21-tetracosatetraenoic acid, which is a previously unknown component of fish lipid. In all, 70 fatty acids were found in the Baltic herring lipids. The following acids, which had not been found in fish oils before, were identified: 14:0i, 16:0i, 18:0i, 15:0b, 16:0b, 17:0b, 18:0b, 14:1i, 16:1i, 17:1i, 19:1i, 20:1i, 18:2ω?, 20:2$^{\omega}$?, 24:3ω3, 24:4ω3, 26:4ω3, 17:2ω 6, 19:2ω?, 19:3ω3, and 21:3ω3. Previously, fish oils had not been found to contain any saturated even-numbered iso acids, saturated acids more branched than iso and anteiso acids, or isomonoenoic acids.

The fatty acid composition of the Baltic herring lipids was similar to that of lipids from other species of the Clupeidae family in that the acids 14:0, 16:0, 16:1, 18:1, 20:5, and 22:6 were present in high proportions and the 25-percent content of saturated fatty acids was of the same order of magnitude. The content of docosahexaenoic acid was higher in lipids from Baltic herring than in those from Atlantic and Pacific herring, but the contents of eicosenoic and docosenoic acids were low in Baltic herring as compared with the contents of the other two species. The mean linoleic acid content of Baltic herring lipids was 4 percent, which is almost the same as in fresh-water fish. The total content of octadecatrienoic, eicosadienoic, eicosatrienoic, and docosatrienoic acids was higher than in lipids of other Clupeidae and other species of marine fish. [193 references]

4.13 POSITIONAL DISTRIBUTION OF ISOMERS OF MONOENOIC FATTY ACIDS IN ANIMAL GLYCEROLIPIDS

Brockerhoff, H., and R. G. Ackman (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of Lipid Research 8, No. 6, 661-666 (November 1967)

Saturated and polyunsaturated fatty acids have definitive structural positions in the phospholipids and triglycerides of animals. Saturated acids always predominate in position 1 of phospholipids; polyunsaturated acids predominate in position 2. A similar, but less precise division, occurs in the triglycerides of depot fats, with exceptions confined to certain related groups of animals. Such a general pattern does not exist for monoenoic acids. The only noticeable regularity with monoenoic acids is a preference of the shorter acids, 16:1 > 18:1 > 20:1 > 22:1, for position 2 in triglycerides, which means 20:1 and especially 22:1 will usually be found in positions 1 and 3. The distribution patterns of monoenes as a group, however, and particularly the distribution patterns of the most common fatty acid, 18:1, are unpredictable. No pattern is perceptible that would recur in the triglycerides or phospholipids of all animals or groups of related animals.

The monoenoic fatty acids of animal lipids are mixtures of isomers. A rapid analysis of such mixtures can now be performed on open-tubular gas-liquid chromatographic columns. The authors used these chromatographic columns to investigate

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 ABSTRACTER: M. F. Tripple

4.20 (*) AN EVALUATION OF THE OXIDATIVE AND FLAVOR STABILITY OF STORED SOYBEAN OILS

Baumann, L. A. (Market Quality Research Division, U.S. Department of Agriculture, Washington, D.C.), and D. G. McConnell, Helen A. Moser, and C. D. Evans (Northern Regional Research Laboratory, U.S. Department of Agriculture, Peoria, Illinois)
Journal of the American Oil Chemists' Society 44, No. 11, 663-666 (November 1967)

The results are reported of 4-year storage tests with crude and refined soybean oils held in 50-gallon drums under conditions simulating field-tank operations. Once-refined oils stored in full drums without breathers showed lower peroxide values and lower dimer contents than did oil stored in full drums with breathers. Refined oils stored in half-full drums showed higher storage temperatures and, consequently, higher peroxide values and dimer contents than did oils stored under any other condition. Nondegummed and degummed crude oils held in storage drums had lower peroxide values and lower dimer contents than did refined oils stored under similar conditions.

The relations are significant not only between storage peroxide values and dimer contents, but also between these figures and flavor scores. Evidently, stored crude or stored refined soybean oils with peroxide values under 60 could be deodorized and used as salad-grade oils with initial flavor quality equal to that of oils processed from stocks having considerably lower initial peroxide values.

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 ABSTRACTER: M. F. Tripple

DISTRIBUTION OF MONOENOIC FATTY ACIDS IN MARINE ANIMALS

OXIDATIVE AND FLAVOR STABILITY OF STORED OILS

4.21 DAMAGE TO ATP BY PEROXIDIZING LIPIDS

Roubal, W. T. (Food Science Pioneer Research Laboratory, Bureau of Commercial Fisheries, Seattle, Washington), and A. L. Tappel (Department of Food Science and Technology, University of California, Davis)
Biochimica et Biophysica Acta 136, pp. 402-403 (1967)
BBA 23328, Short Communications (Reprint)

Following the determination of protein and enzyme products in model systems containing peroxidizing lipids (Roubal and Tappel, 1966), the authors made similar studies with adenosine triphosphate (ATP) as an example of a nucleotide. Similarities exist between peroxidation and ionizing radiation; both lipid peroxidation and ionizing radiation produce free radicals that cause biochemical change.

An emulsion of ethyl arachidonate and phosphate buffer containing ATP was peroxidized to the extent of 2.4 moles of oxygen per mole of arachidonate. Water-soluble products of the reaction were chromatographed on thin layers of cellulose powder. Automated Sephadex-gel filtration was used for fractionation of the water-soluble products from separate peroxidation reactions of both [$1\text{-}^{14}C$] linolenate and unlabeled ethyl arachidonate.

The chromatographic studies indicated the presence of adenosine, adenosine monophosphate (AMP), and adenosine diphosphate (ADP). Sephadex-gel filtration confirmed the presence of AMP and ADP, and of a species having a molecular

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 ABSTRACTER: M. F. Tripple

4.21 (*) PHOTOPEROXIDATION IN ISOLATED CHLOROPLASTS 1. KINETICS AND STOICHIOMETRY OF FATTY ACID PEROXIDATION

Heath, Robert L. (Biology Department, Brookhaven National Laboratory, Brookhaven, New York), and Lester Packer (Department of Physiology, University of California, Berkeley 94720)
Archives of Biochemistry and Biophysics 125, No. 1, 189-198 (April 1968)

This paper describes a photoinduced cyclic peroxidation in isolated chloroplasts. When chloroplasts in an osmotic buffered medium are illuminated, they consume oxygen, bleach endogenous chlorophyll, and produce malondialdehyde (MDA), which is a decomposition product of triunsaturated fatty hydroperoxides. All these processes show (1) no reaction in the absence of illumination; (2) an initial lag phase of 10-20 min. in duration upon illumination; (3) a linear phase in which the rate is proportional to the square root of the light intensity; (4) cessation of reaction occurring within 3 min. after the illumination ceases; and (5) a termination phase after several hours of illumination. The kinetics of the processes fit a cyclic peroxidation equation with velocity coefficients near those for chemical peroxidation.

The stoichiometry of $MDA/O_2 = 0.02$, and $O_2/Chl_{bleached} = 6.9$ correlates well with the efficiency of MDA production in other biological systems and with the molar ratio of unsaturated fatty acids to chlorophyll. The energies of activation for the lag and linear phases are 17 and 0 kcal/mole, respectively, which

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 ABSTRACTER: M. F. Tripple

DAMAGE TO ADENOSINE TRIPHOSPHATE BY PEROXIDIZING LIPIDS

PHOTOPEROXIDATION OF FATTY ACIDS IN CHLOROPLASTS

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The relative rate of peroxide increase for field tank storage can be estimated from linear regression analysis of data from soybean oil stored in drums. Once-refined soybean oil held under large, field-tank storage conditions would not be expected to reach peroxide levels of 60 until after 3 to 4 years of storage, even in warm areas.

4.20

Shmidt, A. A., K. F. Zatulovskaya, R. S. Zamskaya, V. I. Mukhina, A. N. Gezha, L. Ya. Selivanstova, Z. S. Zhizhkina, T. N. Genina, G. T. Korovyakovskaya, and T. V. Ovchinnikova

Chemical Abstracts 65, 13054 (July 4, 1966)

HYDROGENATION AND DEODORIZATION OF A MIXTURE OF WHALE OIL WITH VEGETABLE OILS

4.13

the positional distribution of fatty acids with particular attention to the monoenes. They hoped to find some regularity in the patterns for at least some of the isomers as well as to confirm the hypothesis that the irregular distribution will be confined mainly to the 9-isomers.

Among the organs and species analyzed were liver of a cod (Gadus morhua), an entire mackerel (Scomber scombrus); hepatopancreas of a lobster (Homarus americanus), blubber from a harp seal (Pagophilus groenlandicus), and milk from a fin whale (Balaenoptera physalus).

The description of the monoenoic acids are abbreviated thus: (position of double bond)-(chain length): (number of double bonds). The distributions of the following monoenoic acids were determined: 7-, 9-, and 11-16:1; 7-, 9-, and 11-, and 13-18:1; 9-1, 11-, and 13-20:1; 9 + 11-22:1 and 13-22:1. As a rule, all isomers of a group exhibit different distribution patterns. The 7- and 13-isomers of 18:1 accumulate in position 1 in the phospholipids of fish and mammals. These isomers accumulate in positions 1 plus 3 in triglycerides of mammals that feed on fish, and this distribution is shared by 7-16:1 and 11-16:1 and by the groups of 18:1 accumulate in position 1 in the phospholipids of fish and mammals. These isomers accumulate in positions 1 plus 3 in triglycerides of mammals that feed on fish, and this distribution is shared by 7-16:1 and 11-16:1 and by the groups 20:1 and 22:1. The positional distribution of the acids seems to depend on their structure, and the 9-isomers in general accumulate in position 2; however, in triglycerides the origin of the acid also seems to play a directing role, and the exogenous acids are incorporated into positions 1 and 3. The variability of the distribution patterns of 9-16:1, 9-18:1, and 11:18:1 contrasts with the regularity of the patterns for saturated and polyenoic acids. This variability might be connected with the ability of the endogenous monoenoic acids to balance fluctuations in the supply of the exogenous polyenoic acids and with the role of the fatty acid 9,10-dehydrogenation mechanism in the maintenance of structural and physical properties of phospholipids and triglycerides. [32 references]

4.22

METHODS OF AND ARRANGEMENTS FOR THE CONTINUOUS HYDROGENATION OF OILS AND FATS

British Patent 1,066,880

Abstracts from Current Scientific and Technical Literature 20, No. 6, Abstract No. 1422, p. 273 (June 1967)

A continuous method of hydrogenating fats and oils requires that one add a dispersed catalyst to the oil, pass the oil over several perforated plates in a column, and pass hydrogen through the column.

4.21

are the same as those for autoxidation. The dependence upon temperature and O_2 concentration during the linear phase of oxygen uptake indicates that during the reaction, oxygen tension at the site of peroxidation is 100-fold lower than in the aqueous phase.

The authors conclude that illuminating isolated chloroplasts causes a cyclic peroxidation initiated by the light absorbed by chlorophyll. Photoperoxidation results in destruction of both chlorophyll and triunsaturated fatty acids of the chloroplast membranes. [29 references]

4.21

weight of 700. A simple free-radical addition polymerization, as in the case of protein-lipid peroxidation products, does not appear to be involved because compounds with a molecular weight of 700 are not whole multiples of ATP.

The soluble ATP reaction product, as isolated via Sephadex-gel filtration, contained a low level of incorporated lipid; about 4.10^{-4} mole linolenate was incorporated per mole of equivalent ATP. Although the extent of oxidation reached a limiting value with linolenate, lesser amounts of ADP and AMP were formed with linolenate than were formed with arachidonate. The low amount of lipid incorporated and the fact that both chromatographic techniques substantiate the formation of ADP and AMP indicated that cleavage of phosphate is a predominant reaction in peroxidizing lipid-ATP mixtures.

ADP reaction products were investigated using only Sephadex-gel filtration. The only difference between the reaction products and the control was the existence of a small peak in the molecular weight region of ATP. The authors feel it is evident that peroxidation lipid-nucleotide interactions lead to products of both increased and decreased molecular weight. In contrast to peroxidizing lipid-protein studies, the nature of the polymeric material and the pathway leading to such products have not been elucidated.

In a study of ADP, Hems (1958) showed that 0.3 mole of ADP was destroyed per ion pair, or about 10 times the damage noted in the case of equivalent lipid peroxide-protein interaction. The damaging efficiency of lipid peroxidation for nucleotides, however, was much less at 2.10^{-5} mole ATP destroyed per mole of free radicals. Qualitatively, the picture for ionizing radiation and peroxidation damage is similar; less ADP and AMP were noted in the case of irradiated ATP where most of the product was adenine.

4.23

CHANGES OF FISH FAT DURING CURING. II - INTERACTION OF FISH LIPIDS AND PROTEIN DECOMPOSITION PRODUCTS

Bel, V. V., and S. R. Dombrova (Astrakhan. Tekh. Inst.; Astrakhan, U.S.S.R.)

Chemical Abstracts 67, No. 10, 45068c (September 4, 1967)

4.2

THE CHEMISTRY AND PHYSICAL CHEMISTRY OF UNSATURATED FATTY ACIDS

Stenhagen, Einar (Inst. Med. Biochem., Univ. Gothenburg, Sweden)

Chemical Abstracts 66, No. 23, 101777b (June 5, 1967)

4.7 FISH OIL INDUSTRY IN SOUTH AMERICA

Torres, J. R. Sánchez (Technological Department, Instituto del Mar del Peru, La Punta-Callao, Peru)
Reprinted from Fish Oils, Chapter 26, pp. 394-404 (Avi Publishing Company, Westport, Connecticut [1967])
Circular 282, 12 pp. (December 1967) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

Since 1961, Peru has been the world's largest producer of fish oils. Because this industry is more important than any fisheries in the other South American countries, this report is devoted primarily to the anchovy oil industry in Peru.

Fish oils manufactured from livers of shark and bonito were the first fish oils produced in Peru. Since this industry has been operating for many years, experience has made these operations more advanced industrially than are those of the recently developed anchovy oil industry. The large development in recent years of the anchovy fishery, which was exploited from 1961 to 1964 by over 2,000 vessels, means that this fishery provides over 95 percent of all the fish handled in Peru.

With the expansion in the production of fish meal, the production of fish oil has also increased, and fish oil is becoming an important part of the Peruvian economy. Anchovy oil, the byproduct of fishmeal production, is generally obtained by centrifugation of the press liquor during processing of the meal. The
(over)

 ABSTRACTER: M. F. Tripple

4.90 HYPOCHOLESTEROLEMIC EFFECTS OF MARINE OILS

Peifer, James J. (Hormel Institute, University of Minnesota, Austin 55912)
Reprinted from Fish Oils, excerpt from Chapter 23 (Avi Publishing Company, Westport, Connecticut [1967])
Circular 285, 16 pp. (April 1968) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

The nutritive value of fish and fish products can be influenced by the chemical nature of their fats and lipid components. The dietary effects of fish oils have received attention because of their reported ability to lower the blood cholesterol levels of both men and animals. This effect of marine oils and other polyunsaturated oils appears to be due largely to their abundant supplies of polyunsaturated fatty acids. In recent years, there has been a continuing series of reports concerning the effectiveness of fish and fish oils as hypocholesterolemic agents. This report reviews the hypocholesterolemic property of marine oils and specific polyunsaturated acids. Some of the reported interrelations between cardiovascular diseases, hypercholesterolemias, and polyunsaturated oil treatments are discussed.

Clinical and experimental studies with animals suggest that a sustained hypercholesterolemic condition is accompanied by the onset of serious cardiovascular diseases in both man and animals. Isocaloric substitution of polyunsaturated oils for more saturated acids in the diet has proved to be an effective treatment for the hypercholesterolemias of man and various experimental animals.
(over)

 ABSTRACTER: M. F. Tripple

4.91 (*) DISPROPORTIONATELY HIGHER LEVELS OF MYOCARDIAL DOCOSAHEXAENOATE AND ELEVATED LEVELS OF PLASMA AND LIVER ARACHIDONATE IN HYPERTHYROID RATS

Peifer, James J. (University of Minnesota, The Hormel Institute, Austin 55912)
Journal of Lipid Research 9, No. 2, 193-199 (March 1968)

The high mortality rate in mice or rats caused by a severe thyrotoxicosis is significantly reduced when either linoleate or a concentrate of eicosapentaenoic (20:5) and docosahexaenoic (22:6) fatty acids is included in the dietary fat. This protective effect of the polyunsaturated fatty acids (PUFA) suggested an increased requirement for polyunsaturated acids, possibly for both linoleate and linolenate families of PUFA, in hyperthyroid animals. Recent studies have suggested that the greater need for PUFA is partially met by an accelerated biosynthesis of arachidonate or docosahexaenoate in the hepatic tissue of hyperthyroid animals. In most of the reported studies, however, linoleate has been the only major source of exogenous PUFA. Few data are available concerning the tissue levels of docosahexaenoate and other members of the linolenate family of acids in animals with thyroid imbalances.

This report describes the effects of induced hyperthyroidism on the metabolism and distribution of PUFA in hepatic and myocardial tissues and plasma of rats that were fed diets containing 1 percent each of linoleate and linolenate.
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 ABSTRACTER: M. F. Tripple

6.31 THE HARVESTING OF SEAWEED

Aberdein, Cyril (J. W. Cumming and Son, England)
Fishing News International 7, No. 2, 24-28 (February 1968)

The author feels that there must be an improvement in harvesting techniques if satisfactory future development is to be realized for the expanding seaweed industry. The bulk of seaweed is currently being harvested by hand, which is slow and is becoming increasingly expensive. Many areas of top grade seaweed cannot be harvested because of a lack of labor. As most seaweed occurs in rocky, barren, and often remote regions, harvesting is dependent on the availability of local labor. The ideal harvester should operate at depths down to 6 fathoms so that it can work independently of tidal conditions. The method of cutting or gathering the weed should not injure the seaweed beds.

Many claims have been made about mechanical seaweed harvesters, but these claims have never been substantiated. The author knows of no commercially used harvester. Most projected harvesters are based on the idea of a large, flexible tube with a rotating cutter at the end. The cutting end is dragged along the sea bottom, and the cut weed is drawn up by a pump in a stream of water. Trawls with cutting blades and metal collecting frames with rigid cutters have also been suggested. A Norwegian seaweed manufacturer converted a fishing vessel to seaweed collection. Initial results were satisfactory and further developments are planned.
(over)

 ABSTRACTER: M. F. Tripple

SOUTH AMERICAN FISH-OIL INDUSTRY

HYPOCHOLESTEROLEMIC EFFECTS OF MARINE OILS

EFFECTS OF HYPERTHYROIDISM ON FATTY ACIDS

TECHNIQUES OF HARVESTING SEAWEED

4.90

Many different types of marine oils, which are polyunsaturated, have similar hypocholesterolemic activities. Marine oils, or concentrates of their polyunsaturated acids, have been found to be more effective as hypocholesterolemic agents than are oils that contain only linoleate as the polyunsaturated acid component. The polyunsaturated acid components of marine oils appear to have the primary responsibility of lowering the blood and tissue cholesterol levels of hypercholesterolemic subjects. The hypertriglyceridemia of man has also been successfully treated by including menhaden oil in the diet. The relative hypocholesterolemic activities of vegetable and marine oils are not readily predictable on the basis of such criteria as their total unsaturation, total contents of polyunsaturated acids, or their relative contents of saturated and monounsaturated acids. The dietary effects of the saturated fats may be due to their myristate component.

Minimal intakes of polyunsaturated acids from marine oils have been sufficient to promote significant hypocholesterolemic responses in man and animals. This was true even when 3 to 25 times as much saturated fat was included in the diet. Increased metabolic requirements caused by thyrotoxicosis can be partially alleviated by feeding the linolenate homologues of marine oils and oils rich in linoleate. The hypocholesterolemic effects of marine oils have been seen in diabetic humans and in hypothyroid animals. Significantly lower levels of cholesterol have been found in the liver and other tissue of animals treated with marine oils. The high levels of circulating polyunsaturated acids that result from treatments with marine and vegetable oils appear to have little influence on the brain and reproductive tissues of adult animals.
[202 references]

6.31

Because brown seaweeds are larger and more abundant than red seaweeds, they offer the best area for increased mechanized reaping. A vessel for harvesting brown seaweed off the Scottish coast has been proved technically and economically, but it has never been used commercially. The vessel has a specially designed grapnel that is lowered, raised, and emptied; a conveyor belt with hooks at each link provides a steady flow of seaweed into the boat.

An American company has developed a mechanical harvester that is capable of handling large tonnages of brown seaweed as a one-man operation. The barge-type unit has slightly over 11 tons of equipment on it. Priced at $62,000 and with a life expectancy of 15 to 20 years, the harvester would pay for itself if it proves to be adaptable to a variety of commercial seaweeds. Harvesting is by means of a front scoop with an ascending wire mesh conveyor belt, which drops the weed into the boat. When the vessel is full, it is towed to shore, where the conveyor belt is reversed and the load is dumped. The barge is reported to be highly mobile--it can move on land with its retractable wheels and a towing vehicle.

The author believes that a possible detriment to future developments in the field of mechanization is that the seaweed industry is composed of a number of relatively small companies characterized by skepticism about many new developments. He feels it is logical that companies outside the seaweed industry with expert knowledge of marine equipment would be in a better position to assist in the development of mechanical harvesters than organizations whose prime function is to work with an already harvested product.

4.7

production of anchovy oil amounted to 155,000 metric tons in 1963; however, this increase in production lowered the price in the international market.

Fish oil in Peru can be classified as raw or crude, semirefined, refined, and oil sludge. Refined anchovy oil is an excellent product with many applications. The main uses and applications of anchovy oil in various states are in the manufacture of margarine, soaps, and vitamin concentrates; in the steel and tannery industry; and for export as either crude or semirefined oil. Anchovy oil can be transformed into a high-quality hydrogenated oil with conventional processing techniques. The refining of the crude anchovy oils is best done immediately because the crude oils cannot be refined to a high-quality product after a delay of several months.

The efficient treatment of fresh oils makes it possible to use them for nutritional purposes. The price of fish oils in Peru is low in comparison to the price of vegetable oils, which are in short domestic supply. To supplement vegetable oils with fish oils, it is necessary to process the fish oils into edible products. Ordinary refining is not presently feasible, so it is necessary to convert the oil to a stable hydrogenated fat. Despite the high cost of hydrogenation, this treatment offers a favorable economic balance because of the price difference between fish oil and other edible oils in Peru. Hydrogenated fish oil with an adequate melting point is an excellent base material for the manufacture of soap.

In view of the notable increase in local consumption in Peru and other South American countries, the fish-oil industry has an encouraging future. Derived products of high quality will contribute to industrial progress and development.

4.91

Levels of the linolenate family of acids in the hepatic tissues and plasma were not greatly affected by the hyperthyroidism; however, the heart of the hyperthyroid rat contained 425 percent more docosahexaenoate than did the euthyroid control. Hyperthyroid rats had accumulations of 85, 105, and 114 percent more arachidonic acid in their heart, plasma, and liver, respectively, than the controls did. Most of the total increases in plasma and liver fatty acids were due to the greater accumulations of palmitic, stearic, and oleic acids; the hepatic level of oleate was raised by 204 percent. Hyperthyroid rats had 106 percent more total fatty acids in their hearts than euthyroid rats did. This increase was largely due to the greater accumulation of polyunsaturated acids.

The thyroid hormone appears to accelerate the biosynthesis of both arachidonate and docosahexaenoate. These endogenous polyunsaturated acids are then selectively incorporated into the cardiovascular tissues. The author discusses other possible relations between thyroid action and tissue polyenoic acids in "cold-stressed" animals. [48 references]

4.14 HYDROGENATED MARINE FAT, ITS INFLUENCE ON THE FATTY ACID COMPOSITION OF DEPOT FATS AND LIVER LIPIDS IN THE RAT

Braekkan, O. R., G. Lambertsen, P. Utne, and L. R. Njaa (Govt. Vitamin Lab., Norw. Fish. Res. Inst., Bergen, Norway)
Chemical Abstracts 69, No. 1, 1088w (July 1, 1968)

6.52 UTILIZATION OF FISH FOR ANIMAL FOOD IN B.C. [BRITISH COLUMBIA]

Forrester, C. R. (Fisheries Research Board of Canada, Biological Station, Nanaimo, British Columbia)
Fisheries of Canada 20, No. 10, 17-21 (April 1968)

During the early 1950's, an active trawl fishery for bottom fish developed in British Columbia to meet the demands for animal food from the expanding fur farm industry on the west coast. The species of fish used for the animal food were primarily those fish that were not used for human consumption. This report reviews recent trends in this particular fishery, both as to magnitude and species of composition of landings. The report also considers market potential and probable total use of fish for animal food in British Columbia.

The average annual landings of whole fish for animal food between 1945 and 1950 were less than 50,000 lb. The landings rose from about 400,000 lb. in 1951 to over 10,500,000 lb. in 1956. Since 1956, landings have fluctuated between 3.0 and 7.6 million lb., with an annual average of about 4.9 million lb. Animal food landings in 1956 constituted 36 percent of the total trawler landings; since 1956 they have averaged about 16.5 percent of the total landings.

During the 1951-56 period, the turbot (Atheresthes stomias) and the whiting (Theragra chalcogrammus) constituted over 80 percent of the landings for animal

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 ABSTRACTER: M. F. Tripple

7.51 SPECIES DIFFERENCE IN FISH MUSCLES.
I - THE GEL-FORMING ABILITY OF HEATED GROUND MUSCLES

Ueda, Tadao (Ajinomoto Central Laboratory, Kawasaki, Japan), Yutaka Shimizu, and Wataru Simidu
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 4, 357-361 (April 1968) (In English)

In 1966, Ueda reported that species differences did not affect the intrinsic viscosity value, electrophoretic mobility, or salting-in and salting-out range of purified fish actomyosin. He did find, however, that these differences influence the rate of denaturation and the temperature at which denaturation occurs. Since actomyosin plays an important role in the gel strength of fish muscle products, the present authors undertook to find out how the mechanism of gel formation is affected by species differences.

The ground muscles of yellowtail (Seriola quinqueradiata), star-spotted shark (Mustelus manazo), red halibut (Hippoglossoides dolus), swordfish (Histiophorus [Istiophorus] orientalis), shotted halibut (Eopsetta grigorgewi), lizard fish (Saurida undosquamis), and white croaker (Argyrosomus argentatus) were made into homogeneous, viscous sols and packed in polyethylene films. The samples of ground muscle were then heated at various temperatures ranging from 20° to 50° C. for 30 min., immediately cooled in an ice bath, and reheated for 30 min. at temperatures ranging from 85° to 90° C. The first heat treatment was designed to cause setting, the second to produce a gel.

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 ABSTRACTER: L. Baldwin

6.54 (*) FISH PROTEIN CONCENTRATE. PARTS 1 AND 2

Sparre, T.
Meldinger FRA SSF No. 4, pp. 85-91 (December 1966); No. 1, pp. 18-21 (February 1967) (In Norwegian)
World Fisheries Abstracts 18, No. 3, 47-48 (July-September 1967)

The article surveys the methods used in manufacturing fish protein concentrate (FPC, edible fish meal). It calls attention to the world's desperate need for more protein food; mentions the efforts made by FAO, UNICEF, WHO, and other international organizations; and reviews the work previously carried out in Norway, South Africa, and other countries, and more lately in the United States. It points out that the real difficulties lie in making such novel food acceptable to the indigenous consumer and in assuring the economic practicality of the method. It suggests that these difficulties must be overcome from the outset.

The first part of the article discusses three methods that have already been suggested for the manufacture of FPC--the chemical, the biological, and the physical methods. The first method, which involves a solvent extraction process and is often combined with fishmeal manufacture, is the most common. The raw material for this process may be started either from dried fish meal, an intermediary product (for instance, the press cake), or raw fish.

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 EXTRACTOR: L. Baldwin

7.51 (*) SPECIES DIFFERENCE IN FISH ACTOMYOSIN.
III - THE VELOCITY AND MECHANISM OF HEAT-DENATURING REACTION

Ueda, Tadao (Ajinomoto Central Laboratory, Kawasaki, Japan), Yutaka Shimizu, and Wataru Simidu
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 4, 351-356 (April 1968) (In English)

Viscosity measurements of heat-denatured fish actomyosin made by the authors in 1963 and 1964 showed that the actomyosin of some fish denatured easily whereas that of others did not. In the present work, the rate at which the actomyosin of shotted halibut (Eopsetta grigorjewi), a star-spotted shark (Mustelus manazo), and flying fish (Cyosisthopus hiraii) was denatured by heat was determined.

Assuming that heat denaturation of fish actomyosin is a first-order reaction, the authors plotted the changes in intrinsic viscosity of the actomyosin of all three fishes under various temperature conditions, calculated the velocity of heat denaturation and plotted the change in viscosity as a function of time, compared the velocity constants of heat denaturation at various temperatures, and determined the activation energies for the three kinds of actomyosin. They found that the activation energy for the shotted halibut was 56.0 kcal.; for the flying fish, 54.2 kcal.; and for the star-spotted shark, 54.0 kcal. They conclude, then, that the activation energy for heat denaturation of fish actomyosins is about 55 kcal/mole regardless of species. They assume that fish actomyosins are heat-denatured by a similar mechanism even though the specific reaction rates differ according to species.

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 ABSTRACTER: L. Baldwin

UTILIZING FISH FOR ANIMAL FOOD

REVIEW OF FISH PROTEIN CONCENTRATE PROCESSING METHODS

GELLING CHARACTERISTICS OF FISH MUSCLE

RATE AND MECHANISM OF ACTOMYOSIN DENATURATION BY HEAT

6.54

The second part of the article briefly describes these processes and locates the site of manufacture. Starting from dried fish meal: Extraction of pilchard or maasbanker meal with ethanol, FIRI-institute, S. Africa. Extraction of sardine meal with isopropanol, Azote Union, Safi, Morocco. Extraction of hake meal with hexane or ethanol, Quintero, Chile. Starting from press cake: Extraction with isopropanol after pretreatment of press cake, Halifax. Starting from raw fish (cod fillet offal): Extraction (and dehydration) with cold ethanol, Fiskeridirektoratet, Bergen. Extraction of menhaden with isobutanol, United States.

6.54 THE BRIGHT SPOT IN ETHANOL'S FUTURE

Anonymous
Chemical Week 102, No. 10, 49-51 (March 9, 1968)

The use of ethanol as a solvent has steadily increased from 67 million gallons in 1960 to 108 million gallons in 1967. Ethanol's share of the solvent market rose from 24 percent to 36 percent during the same period. The overall use of ethanol is expected to grow at a rate of 3 percent per year and reach 327 million gallons in 1970; the use of ethanol as a solvent should account for virtually all the increase.

A possible market for ethanol may exist in the production of fish protein concentrate (FPC), which is being developed to alleviate the world food shortage. Some producers of FPC are investigating the use of ethanol as the solvent for extracting the concentrate. Most solvent processes now use isopropanol and ethylene dichloride; however, a solvent-extraction process used in Brazil utilizes ethanol as the solvent. [Abstracter: M. F. Tripple]

6.52

food. In recent years, there has been increased utilization of the butter sole (Isopsetta isolepsis) and several species of rockfish. Between 1958 and 1966, at least 44 species of fish, representing 12 families, were landed for animal food. The majority of these fish were captured incidentally in fisheries for other species and were unsuitable for the fillet market.

The annual utilization of trawl-caught bottom fish by pet-food processors is about 250,000 lb., which is less than 10 percent of the total animal food landings. The major markets for bottom fish for animal food in British Columbia appear to be the fur farms, principally the mink ranches. Although the number of mink ranches licensed in British Columbia has declined to just under 300 from the peak of about 380 in 1957, the total number of mink carried as breeding stock has shown a steady increase from under 30,000 animals in 1948 to almost 161,000 in 1965. A diet of 50 percent fish for the 1965 mink stock would require just over 30 million lb. of fish, so virtually all fish for animal food that were landed, produced, or imported in 1965 were used for mink food.

Despite the growth of the fur farm industry, landings of whole fish for animal food have decreased from the peak landings in 1956. Some variation in the volume of landings of fish in recent years does not appear to be associated with any decline in abundance of the species. During this period, however, the landed value of most trawl-caught species has increased, whereas the prices for fish for animal food have shown little change. Landings of fish for the fillet market have risen with no increase in fishing effort. It appears that increased demand and high prices for other species have left little fishing effort available for the animal food industry.

USE OF ETHANOL IN FISH PROTEIN CONCENTRATE PRODUCTION

7.51 IDENTIFICATION OF FISH SPECIES BY AGAR GEL ELECTROPHORESIS

Hill, Wilma S., Robert J. Learson, and J. Perry Lane (Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Massachusetts 01930)
Journal of the Association of Official Analytical Chemists 49, No. 6, 1245-1247 (December 1966)

Previous methods for identification of fish species, though reliable, require 6 to 9 hours to perform. The gels are not stable and must be used soon after preparation. To obtain a permanent record of patterns, gels must be submerged in a solution of acetic acid. The method and apparatus designed by Wieme (1962) and used to separate serum proteins offer several advantages. Wieme's procedure takes less time, standard patterns can be permanently preserved on slides, and electrophoresis is performed under constant voltage and temperature. This report describes the modifications that were made in Wieme's method to adapt it for the separation of the water-soluble proteins of fish. The object was to develop a rapid, convenient, and reliable method for identification of fish species.

Agar gel is used as the supporting medium in the electrophoretic method. Electrophoresis occurs under constant temperature and voltage. The gels are fixed to glass histological slides that may be preserved indefinitely. The protein is detected by staining the slides. Six determinations may be done simultaneously in less than 3 hr. The method has been successfully applied to expressed fluid, drip, and extracts from fish in fresh, frozen, freeze-dried, and precooked states. [Abstracter: M. F. Tripple]

7.51

"Setting" is a phenomenon that occurs during the manufacture of such fish products as kamaboko and fish sausage. When homogeneous sols made from ground muscle are heated at about 30° C. for a short time, they change into more viscous elastic structures. Ground muscles that have set will give strong gels if they are heated at about 90° C.; however, if the setting structure is broken down, the gel strength decreases.

When ground muscle sols are heated at about 30° C., the closely folded peptide chains of myosins unfold and free radicals are exposed. These unfolded coils combine alternately with each other to form a three-dimensional net. This structure is, apparently, the structure that is formed during setting. When the heat treatment is too high, however, the unfolded actomyosin molecules do not combine alternately with each other, and the three-dimensional net is not formed. Deformation of the net structure by heat coagulation of the actomyosin causes abrupt and sizeable decreases in gel strength. The temperature ranges over which changes in gel strength occur differ with species.

Fish	Setting temperature (°C.)
Red halibut	25
Shotted halibut	25
White croaker	30
Lizard fish	30
Star-spotted shark	35
Swordfish	35
Yellowtail	35

The optimum temperature at which the highest gel strength occurs for the seven types of fish muscle tested is illustrated on the left.

IDENTIFICATION OF FISH SPECIES BY ELECTROPHORESIS

7.51 (*)

ION-EXCHANGE CHROMATOGRAPHY OF NUCLEOTIDES ON POLYETHYLENEIMINE CELLULOSE COLUMNS: ANALYSIS OF MAIZE GRAIN EXTRACTS

Christianson, D. D., J. W. Paulis, and J. S. Wall (Northern Regional Research Laboratory, U.S. Department of Agriculture, Peoria, Illinois 61604)
Analytical Biochemistry 22, No. 1, 35-46 (January 1968)

Free nucleotides are difficult to isolate and identify in complex mixtures, such as extracts from plant tissues. The ion-exchange chromatographic techniques introduced by Cohn (1950) made possible the separation of a large number of nucleotides and their derivatives. Other investigators have chromatographed the nucleotides from plant materials on polystyrene anion-exchange resins with various eluants; however, large amounts of ultraviolet-absorbing phenolic contaminants in the extract interfered with the chromatographic analysis on the ion-exchange resins. Preliminary purification of such extracts became necessary, but this resulted in a loss of nucleotides. Similar difficulties were encountered when polystyrene anion-exchange resins were used to separate the nucleotides isolated from maize. Therefore, it became necessary to investigate other ion-exchange materials for separating nucleotides.

In the work presented in this paper, polyethyleneimine (PEI)-microcrystalline cellulose was used as the ion exchanger in column chromatographic separations. The nucleotide mixtures were resolved with a gradient elution system that allowed

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 ABSTRACTER: M. F. Tripple

7.593

A RAPID METHOD FOR THE DETERMINATION OF p,p'-DDT TO p,p'-DDE RATIOS IN FISH

Fort, Doris L. (Southeast Water Laboratory, Athens, Georgia 30601)
Journal of Chromatography 34, No. 1, 120-121 (March 26, 1968)

The authors describe a method of analyzing for the presence of DDT (dichlorodiphenyltrichloroethane) in fish that is more rapid than the commonly used method of Mills, et al. (1963) is. The procedure was developed to fulfill the need for a routine and rapid determination of the ratio of p,p'-DDT to its metabolites. Although the recoveries of the pesticides from the tissues were not as high as those obtained with the method of Mills et al., it was found to be satisfactory for obtaining the ratios of p,p'-DDT to p,p'-DDE (dichlorodiphenylethane).

Samples of fish tissue ranging from 0.005 to 0.1 gram were digested in 2-4 milliliters of formic acid. The solutions were maintained at 60° for 1.5-2 hours and were then extracted four times with hexane. The extracts were combined and evaporated to dryness, and the residue was washed with three 2-ml. portions of acetonitrile. A small amount of alumina (20 milligrams of 80-200 mesh) was added to the residue, and the sample was centrifuged. The supernatant was evaporated to dryness, and the residue was dissolved in a small amount of ethyl acetate and spotted on a plate coated with aluminum oxide.

The samples contained ^{14}C-labeled DDT and its corresponding metabolites, DDE and DDD (dichlorodiphenyldichloroethane), so a radio chromatogram scanner was

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 ABSTRACTER: M. F. Tripple

7.524

AMINO ACID RADICALS PRODUCED CHEMICALLY IN AQUEOUS SOLUTIONS. ELECTRON SPIN RESONANCE SPECTRA AND RELATION TO RADIOLYSIS PRODUCTS

Armstrong, W. A., and W. G. Humphreys (Defence Chemical, Biological and Radiation Laboratories, Defence Research Board, Ottawa, Canada)
Canadian Journal of Chemistry 45, No. 21, 2589-2597 (November 1, 1967)

The study of the radiation chemistry of aqueous amino-acid solutions has been hampered by a lack of information about the identity of the amino-acid radicals formed by the initial reactions of the oxidizing and reducing species produced during the radiolysis of water. In many instances, the identity of these radicals could be determined from their electron spin resonance (ESR) spectra; however, a steady-state radical concentration of about 10^{-6} M over a period of at least 1 min. is necessary for detection, and the difficulties inherent in coupling a radiation source capable of producing these conditions with an ESR spectrometer have not been solved.

Much of the radiation damage to organic solutes in aerated solutions is caused by the oxidizing species. Most of the reducing species are scavenged by oxygen to form hydroperoxyl radicals, which are relatively unreactive with most amino acids. Therefore, a chemical method of producing high concentrations of hydroxyl radicals could be used to simulate the effects of ionizing radiation on aerated aqueous solutions. The reaction of titanium trichloride with hydrogen peroxide has been used as a source of OH radicals for ESR studies. The evidence suggests that the oxidizing species is a Ti(IV) complex of OH, and that the

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 ABSTRACTER: M. F. Tripple

7.86 (*)

USE OF IMMUNOFLUORESCENCE AND ANIMAL TESTS TO DETECT GROWTH AND TOXIN PRODUCTION BY CLOSTRIDIUM BOTULINUM TYPE E IN FOOD

Midura, T., C. Taclindo, Jr., G. S. Nygaard, H. L. Bodily, and R. M. Wood (Microbial Diseases Laboratory, Division of Laboratories, California State Department of Public Health, Berkeley, California 94704)
Applied Microbiology 16, No. 1, 102-105 (January 1968)

During experiments to determine whether Clostridium botulinum Type E could produce toxin in a variety of vacuum-packed foods that were experimentally inoculated with spores, turkey roll was the only packaged sample that supported spore outgrowth and toxin development at 30° C. after 11 days of anaerobic incubation (Taclindo, et al., 1967). Use of a direct fluorescent-antibody method on the 11th day of incubation did not reveal the presence of fluorescent cells in the turkey roll that contained toxin. However, other meat products that were negative for toxin did contain fluorescent organisms. These observations stimulated interest in studying the possible simultaneous growth of C. botulinum vegetative cells and toxin production in turkey rolls. The purpose of this investigation was to assess the value of immunofluorescence for screening food specimens incriminated in suspected outbreaks of botulism by determining the following: (1) how early and how long is the toxin present, as detected by animal tests; (2) how early and how long can vegetative cells be detected by immunofluorescence; and (3) what is the relation between these two phenomena.

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 ABSTRACTER: M. F. Tripple

7.524

reaction of OH with the scavenger occurs during the decomposition of the $[Ti(H_2O)_4(OH)(scavenger)]^{4+}$ complex (Chiang et al., 1966). This may affect the rate of reaction of OH with the scavenger, but it need not change the nature of the resultant radical.

This system was used in the present investigation to generate a variety of amino-acid radicals, and their ESR spectra were recorded. The final products were compared with those obtained by the γ-irradiation of oxygenated aqueous solutions to determine whether the two systems were analogous.

Amino-acid radicals were generated, and the radicals were identified by ESR spectroscopy. An amino-acid analyzer was used to show that the products of this reaction were the same as those of the corresponding γ-irradiated, oxygenated, aqueous amino-acid solution. Cysteine, cystine, and homocystine produced identical spectra that were attributed to $RCH_2S\cdot$ radicals. Penicillamine produced $RC(CH_3)_2S\cdot$ radicals. Most of the other amino-acid radicals were formed by the abstraction of a hydrogen atom from the C_2 position as numbered from the amino group. This was true for dl-α-alanine, β-alanine, taurine, dl-aspartic acid, γ-aminoisobutyric acid, dl-serine, and dl-valine. However, with valine, a lower concentration of the radical resulting from the removal of a hydrogen atom from C_3 was also seen. Abstraction from the C_3 position also occurred with dl-threonine. These results were consistent with the view that the strong negative inductive effect of the HN_3^+ group deactivates the neighboring C-H bonds towards attack by the electrophilic hydroxyl radical. Glycine formed one radical by loss of a hydrogen atom from the C_1 position, and a second radical was formed by deamination. [27 references]

7.51

independent pH and ionic strength changes and borate complexing of the sugar substituents. The procedure was used to analyze complex mixtures of nucleotides in extracts of maize.

Use of a uniform microcrystalline cellulose gave sharper separations of nucleotides as compared with separations using standard fibrous celluloses. Mono- and diphosphate nucleotides and sugar nucleotides were eluted with a concave gradient elution system of LiCl and boric acid, in which the ionic strength and pH were changed independently. Borate complexing facilitated both the separation of sugar nucleotides from their related diphosphate nucleotides and the separation of deoxyribo- and ribonucleotides.

Phenolic materials and other plant constituents that interfere with the detection of nucleotides during chromatography were less readily adsorbed on the PEI-microcrystalline cellulose. Use of this type of column permitted direct analysis of some plant extracts without extensive preliminary purification that might result in degradation and loss of nucleotides. [26 references]

7.51 EFFECT OF BLOCKING THE HEME THIOL GROUP OF TUNA FISH MYOGLOBIN, A SINGLE-CHAIN HEMOPROTEIN

Cassoly, Robert, and Rampersad Banerjee (Inst. Biol. Phys.-Chim., Serv. Biophys., Paris, France)
Chemical Abstracts 68, No. 25, 111456b (June 17, 1968)

BIOCHEMISTRY OF TUNA MYOGLOBIN

7.86

The appearance of both C. botulinum Type E organisms and toxin in experimentally inoculated packages of turkey roll was followed to determine the relation between the presence of vegetative cells and the formation of toxin. The presence of vegetative cells was determined by immunofluorescence; animal tests were used to assay toxin production. Within 24 hr., the detoxified spores of C. botulinum Type E initiated growth that resulted in toxin formation. The presence of fluorescing vegetative cells and of toxin coincided after from 1 to 14 days of incubation. Differences were noted after the next testing date, which was the 21st day of incubation. Toxin could be detected up to the 43rd day; only one vegetative cell was detected on the 28th day. After 56 days of incubation, neither toxin nor organisms could be found. Fluctuations in the amount of toxin present throughout the period of testing were demonstrated by the mouse lethal dose tests (mouse lethal dose per gram of turkey roll). Maximal amounts of toxin were present when fluorescing organisms were also more numerous. The applications of immunofluorescence during this study and in the detection of botulism are discussed. [9 references]

7.86 EXAMINATION OF CANNED FISH PRODUCTS FOR THE PRESENCE OF CLOSTRIDIUM PERFRINGENS [CLOSTRIDIUM WELCHII]

Nikolaeva, S. A., and A. A. Ionova
Konserv. Ovoshch. Prom. 22, No. 4, 28-31 (1967) (In Russian)
Abstracts from Current Scientific and Technical Literature 20, No. 9, Abstract No. 1997 (September 1967)

CLOSTRIDIUM PERFRINGENS IN CANNED FISH PRODUCTS

7.593 (Cross Reference: 9.15)

used to detect the amounts of the radioactive compounds. The use of heptane as an elution solvent for the separation of p,p'-DDT from p,p'-DDE was adequate for most tissues; however, their separation in some tissues was not sufficient to allow the recorder pen of the scanner to return to the base line between the two compounds. Substitution of low-boiling (30°-60°) petroleum ether for heptane as the eluent provided better separation. The difference in R_{DDD} values was small, but it was sufficient to allow the pen to return to the baseline, thereby giving two distinct peaks with more accurate measurable areas than those in which an overlap occurred.

Separation of p,p'-DDT from p,p'-DDE in fish tissues

Tissue	Pesticide	Eluent (R_{DDD} values)	
		Heptane	Petroleum ether
Skin	DDE	2.6	2.9
	DDT	1.9	1.9
Muscle	DDE	3.1	3.3
	DDT	2.0	2.0
Testes	DDE	2.2	2.4
	DDT	1.7	1.7
Kidney	DDE	1.4	1.8
	DDT	1.2	1.3
Ovary	DDE	2.2	2.2
	DDT	1.7	1.7

8.0 BIOCHEMICAL COMPOSITION OF THE MUSCLE OF SOME FRESHWATER FISHES DURING THE PRE-MATURITY PHASE

Khawaja, D. K. (Department of Zoology, Aligrarh Muslim University, Aligarh, India)
Fishery Technology 3, No. 2, 94-102 (July 1966) (Ernakulam, India)

The biochemical composition of given fishes has been observed to vary during different periods of their life history. The work reported here points out some of the biochemical and calorific changes that mark the progression of 18 freshwater fishes from prematurity to postmaturity.

The protein content in the muscles of juveniles ranged from 10 to 19 percent. These values are generally higher than those reported for adults of the same species (Jafri et al., 1964).

The muscle fat of juveniles was low, ranging from 0.020 to 2.219 percent. With one exception, the fat values of juveniles were lower than those reported for adults. The inverse relation between fat and protein content found by Jafri (1964) in adult fishes, though not consistently apparent, was found to exist.

Moisture in the muscle of juveniles was very high, ranging from 78 to 80 percent. This narrow range of moisture content is not duplicated in the adult fishes. The sum of the fat content and the water content was also markedly consistent in the juveniles, ranging from 78.546 to 80.979.

(over)

 ABSTRACTER: L. Baldwin

8.51 (*) STUDIES ON THE PROPERTIES OF FISH ACTOMYOSIN. II - EFFECT OF LECITHIN ON THE SOLUBILITY OF ACTOMYOSIN FROM YELLOWTAIL MUSCLE

Ikeda, Shizunori (Department of Fisheries, Kyoto University, Maizuru, Japan), and Takeshi Taguchi
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 4, 335-338 (April 1968) (In English)

The correlation between the denaturation of structural proteins and the oxidation of fatty-acid lipids in fish has been studied for a decade. Yet the nature of the change that causes insolubilization of the protein in the actomyosin during storage is unreported. In the present paper, the authors extended a study they reported in 1967 on the effect of lecithin and α-tocopherol on the stability of actomyosin from the muscle of yellowtail (Seriola quinqueradiata, Temminck and Schlegel).

The results of the study showed that the amount of protected soluble protein increased proportionally with the increase in the amount of lecithin that was added. However, the protective effect became weaker with the increase in storage time. Examination of the TBA (thiobarbituric acid) value of the actomyosin-lecithin system revealed that peroxide formation also increased.

When α-tocopherol was added to the actomyosin-lecithin system, the increase in TBA was markedly suppressed, as was the decrease in the solubility of the

*Item on back of card.

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 ABSTRACTER: L. Baldwin

8.51 (*) STUDIES ON THE PROPERTIES OF FISH ACTOMYOSIN. III - LECITHIN FOUND IN THE ACTOMYOSIN FROM FISH MUSCLE

Taguchi, Takeshi (Tokyo University of Fisheries, Konan, Minato-ku, Tokyo, Japan), and Shizunori Ikeda
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 4, 339-343 (April 1968) (In English)

The protective effect of α-tocopherol on the solubility of actomyosin suggested to the authors that lipids are present in the actomyosin of yellowtail. These lipids they identified as lecithin. Analysis of the lecithin content at different stages of purification revealed that the purified actomyosin contains a constant amount of lecithin. Extraction of lecithin from the actomyosin preparation with ether and with ethanol-ether (3:1) suggested that the lecithin is possibly bound loosely with protein. The presence of lecithin in the actomyosin of goby (Acanthogobius flavimanus), bass (Lateolabrax japonicus), gray mullet (Mugil cephalus), flatfish (Kareius bicoloratus), rainbow trout (Salmo gairdneri iricleus), and carp (Cyprinus carpio) was investigated next. Although the major part of the lipids in all these fishes was lecithin, the levels varied appreciably--from 0.033 μmoles/mg of protein-N in goby to 0.252 in carp. The content of myosin dissociable from the actomyosin in the presence of adenosine triphosphate paralleled the level of lecithin in the actomyosin. [5 references]

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*Items on back of card.

 ABSTRACTER: L. Baldwin

8.51 CHANGES IN FREE AMINO ACIDS IN SKELETAL MUSCLE OF COD (GADUS MORHUA) UNDER CONDITIONS SIMULATING GILLNET FISHING

Dambergs, N., P. [H.] Odense (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia), and R. Guilbault (Fisheries Research Board of Canada Technological Station, Grande-Rivière, Quebec)
Journal of the Fisheries Research Board of Canada 25, No. 5, 935-942 (May 1968)

The purpose of this study was first to determine the composition of the pool of FAA (free amino acids) in muscle of freshly killed North Atlantic cod and then to explore the changes in the FAA pool in strangulated cod during the 72 hours after the gills were immobilized. This 72-hr. period was equivalent to the time between death and the beginning of industrial processing.

Nineteen FAA in measurable amounts, plus ammonia, were detected in the muscle. Tryptophan and hydroxyproline appeared as traces in a few extracts. The methods used did not register compounds such as trimethylamine oxide, creatine, betaine, and purines that are known to be present in aqueous extracts of cod muscle. Histidine, 1-methyl-histidine, and 3-methyl-histidine were shown as a single peak. No 3-methyl-histidine was detected in the extracts, and histidine and 1-methyl-histidine appeared to be present in about equal amounts. These findings show that in North Atlantic cod the sum of the histidines is the major component of the FAA pool. More than 90 percent of the FAA pool was represented by histidines, taurine, glycine, alanine, lysine, and β-alanine. The FAA pool constituted only 2.4 percent of the amino acids composing the proteins.

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 ABSTRACTER: M. F. Tripple

8.51

actomyosin. Moreover, the protective effect increased with the increase in both added α-tocopherol and time of storage. These results led the authors to assume that the lecithin was protected against oxidative deterioration by the presence of α-tocopherol and the solubility of the actomyosin was protected by the interaction of the lecithin and the α-tocopherol. [11 references]

8.51 STUDIES ON THE LOW MOLECULAR WEIGHT PROTEIN COMPONENTS IN RABBIT SKELETAL MYOSIN

Gaetjens, E., K. Bárány, G. Bailin, H. Oppenheimer, and R. Bárány (Institute for Muscle Disease, Inc., 515 E. 71st Street, New York, New York 10021)
Archives of Biochemistry and Biophysics 123, No. 1, 82-96 (January 1968)

Myosin and heavy meromyosin from rabbit skeletal muscle were chromatographed twice to free them from 5'-adenosine monophosphate deaminase, adenylate kinase, and nucleic acids. The chromatograms revealed protein components of low molecular weight--they were 4.8 percent by weight of the myosin. Chromatography on diethylaminodiethyl-Sephadex A-50 or electrophoresis on polyacrylamide gel separated these proteins into three main components. Separation of the proteins from myosin under various conditions resulted in a concomitant loss of the adenosine triphosphatase activity and of the actin-binding ability of the proteins. Addition of these isolated proteins to myosin that was free of them did not restore the adenosine triphosphatase activity. The data indicated that the low-molecular-weight proteins were tightly bound to myosin; however, the data did not reveal their role in the myosin molecule. [29 references]
[Abstracter: M. F. Tripple]

8.51

Concentrations of taurine, glycine, alanine, lysine, serine, glutamic acid, and cystine generally decreased with time after death. Only the concentrations of phenylalanine and arginine increased with time. Concentrations of tyrosine remained fairly constant. Valine, proline, leucine, isoleucine, aspartic acid, histidine, and β-alanine increased towards the end of the 72-hr. period. On hydrolysis of the extracts, the molar increase of histidine up to 48 hr. after death was about double that of the β-alanine. The increases were about equal at 72 hr. after death. This indicated that not all the combined amount of histidines was derived from anserine; there must be other peptides containing histidine in cod muscle besides β-alanyl-1-methyl histidine.

The overall changes in FAA before hydrolysis indicated that at 38 hr. after death the total of FAA was 26 percent below the initial value; at 72 hr. the concentration had increased somewhat. The decrease in FAA appeared to be accounted for by an uptake of the amino acids into the peptide fraction. The peptide fraction increased up to 48 hr. post mortem and decreased at 72 hr. post mortem.

The results indicated that no drastic changes occurred in the levels of FAA in cod muscle up to 72 hr. post mortem under the conditions of the study. There appeared to be an initial incorporation of amino acids into peptides, followed by a reversal of the trend near the end of the period of rigor. The variation in FAA from fish to fish was considerable and indicated the need for sampling as many individuals as possible. [16 references]

8.0

The percentages of dry matter in juveniles ranged from 19.518 to 21.784, appreciably lower than the percentage found in adults. The percent of dry matter varied inversely with that of moisture.

The percentage of ash varied from 1.040 to 2.096 in the juveniles. These percentages are slightly lower than are those for the adults.

The carbohydrate content showed no definite pattern in the juveniles, ranging from 0.031 to 2.217 percent. Those fishes that had a very low fat and protein content usually had the highest carbohydrate content. Compared with the amount of carbohydrate in the muscle of adult fishes, the amount in the muscle of juveniles was quite low.

Calcium in the muscle of juveniles was fairly high, ranging from 0.017 to 0.095 percent. Compared with the calcium content of adults, these values were quite high.

The phosphorus content, too, was high in juveniles, varying from 0.322 to 0.605 percent. In adults, the fishes that are rich in fat have the highest percentage of phosphorus. No such relation could be seen in the juveniles.

The energy values for the protein fraction ranged from 42 to 80 calories per 100 grams of fresh muscle in the juveniles; however, the total calorific values ranged only from 73 to 94 calories per 100 grams. Thus, the total calorific values were lower than those found for adult fishes. [18 references]

8.51

Species	Lecithin	Actomyosin	Dissociable myosin	
	μmoles/mg of protein-N	Protein-N mg	Protein-N mg	% of actomyosin
Flatfish	0.139±0.020	4.38±0.05	1.88±0.05	42.9±1.7
Rainbow trout	0.117±0.011	5.43±0.09	2.35±0.05	43.3±1.6
Carp	0.252±0.052	4.89±0.03	2.27±0.04	56.1±1.2

8.51 AMINO ACID CONTENT OF FOOD ESTIMATED BY [AN] AMINO ACID AUTO-ANALYZER

Murata, Kiku, Teijiro Miyamoto, and Masako Tanaka
Chemical Abstracts 65, 4527a (August 1, 1966)

8.51 ACTOMYOSIN-LIKE PROTEIN FROM CRAYFISH NERVE: A POSSIBLE MOLECULAR EXPLANATION OF PERMEABILITY CHANGES DURING EXCITATION

Bowler, K., C. J. Duncan (Department of Zoology, University of Durham, England)
Nature 211, 642-643 (August 6, 1966)

The purpose of this research is to show that a protein that resembles the contractile actomyosin of muscle (also an adenosine triphosphatase) is present in the nerve membranes of crayfish. [Abstracter: M. F. Tripple]

LOW MOLECULAR PROTEIN COMPONENTS IN SKELETAL MYOSIN

ACTOMYOSINLIKE PROTEIN FROM CRAYFISH
AMINO-ACID CONTENT OF FISH

8.59 (*)

ELECTRON SPIN RESONANCE STUDIES ON HEART MUSCLE SUCCINIC DEHYDROGENASE UNDER LOW PARTIAL PRESSURES OF OXYGEN

Griffin, James B., Alan P. Baker, and Thomas C. Hollocher (Graduate Department of Biochemistry, Brandeis University, Waltham, Massachusetts 02154)
Archives of Biochemistry and Biophysics 123, No. 1, 152-162 (January 1968)

Results of electron spin resonance (ESR) studies have suggested that soluble preparations of succinic dehydrogenase (SDH) bind oxygen in a largely reversible manner in the presence of succinate. ESR studies on soluble SDH from beef heart under low partial pressures of oxygen are reported in this paper, and the results of these studies are compared with related studies carried out under aerobic conditions. The authors show that the binding of oxygen modifies the process of radical formation in a general manner, which is reflected in the succinate-enzyme interaction and in the effects exerted by kinetic inhibitors of the enzyme.

The ESR properties of SDH at 30° are substantially different from results with aerobic systems when the properties are observed under anerobic conditions or at low partial pressures of oxygen. These differences are attributed to the reversible binding of oxygen to one or more species of the enzyme; the differences are reflected in the ways in which succinate and other dicarboxylic acids influence radical concentration. Irreversible reactions between enzyme and oxygen, such as autoxidation, proceed too slowly to be of importance.

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 ABSTRACTER: M. F. Tripple

8.8

A REPORT TO THE FISHING INDUSTRY ON THE PROBLEM OF DISCOLORED FLESH IN GILL-NET TURBOT (GREENLAND HALIBUT)

Kamra, S. K.
New Series Circular No. 30, 2 pp. (June 15, 1967) (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia)

Landings of Greenland halibut (turbot) have increased from 8,200 metric tons in 1965 to 16,500 tons in 1966 because of an expanding market for frozen fillets in the eastern United States. With the expanded production of fillets, the processing industry is now faced with a problem--as much as one-third of the catch consists of fillets with varying degrees of pink-brown discoloration. Sometimes, the entire fillet is affected in this manner, but the discoloration is usually more pronounced near the tail and bordering the fins. The discoloration appears to intensify when the fillet is frozen, thus making it unattractive and unmarketable. Although the introduction of gill netting has greatly increased total catches and yield per man hour of fishing, the average size of the turbot caught is smaller, and the discoloration of flesh from gill netted fish is causing concern. The results of a survey to determine the factors causing the flesh discoloration and to suggest measures that might be applied as a remedy are summarized in this report.

Turbot gill-net fishermen usually allow a day or two for the nets to settle and haul them a couple of days later. Although keeping the fish 2 days in the

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 ABSTRACTER: M. F. Tripple

9.11 (*)

OCEANOGRAPHY'S ROLE IN DEVELOPING MARINE RESOURCES

Johnson, James H. (Bureau of Commercial Fisheries Biological Laboratory, Seattle, Washington 98102)
Commercial Fisheries Review 30, No. 3, 27-38 (March 1968) (Separate No. 809)

The author of this report outlines the future demands for food and describes some of the oceanographic data and programs needed to develop marine food resources. The emphasis is placed on location, description, assessment, and extraction, though processing and marketing are recognized as being of equal importance to full development of the marine resource. Economic factors must be considered in all the phases of development.

The author presents a series of facts to demonstrate the urgency of the world's need for protein and to point out the poor relation between food supplies and an expanding world population. He then examines the potential harvests that might be expected from the oceans. The possible sustained production from the oceans are by two different approaches. One approach extrapolates the present trends and successes in heavily exploited areas to similar regions that are still unexploited. The other approach is based on food-chain dynamics--the amount of phytoplankton produced in the ocean and the flow of energy through the food chain to fish. Both of these methods have shortcomings; the former approach appears to give lower estimates than the latter. The author feels that, though there is a need for further study on the processes governing ocean productivity to refine the estimates now being made, production from the sea can be significantly increased.

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 ABSTRACTER: M. F. Tripple

9.15

PESTICIDE LEVELS IN FISH OF THE NORTHEAST PACIFIC

Stout, Virginia F. (Bureau of Commercial Fisheries Technological Laboratory, Seattle, Washington 98102)
Bulletin of Environmental Contamination and Toxicology 3, No. 4, 240-246 (1968)

A program was begun by the Bureau of Commercial Fisheries to monitor the pesticide levels of edible fish in the Pacific Northwest. The residues monitored were DDT (dichlorodiphenyltrichloroethane) and its metabolites DDE (dichlorodiphenylethane) and TDE (tetrochlorodiphenylethane). The species of fish and shellfish sampled were anchovy (Engraulis mordax), Dungeness crab (Cancer magister), English sole (Parophrys vetulus), hake (Merluccius productus), ocean perch (Sebastodes alutus), starry flounder (Platichthys stellatus), true cod (Gadus macrocephalus), and yellowtail rockfish (Sebastodes flavidus).

The data in the table on the back of the card indicate that the level of pesticide residues in marine products is substantially below the currently acceptable 7 p.p.m. allowed by FDA (Food and Drug Administration) in beef. The fillets contain substantially lower levels of pesticide than the remaining carcasses do. The pesticide levels in fillets undoubtedly represent a more accurate estimate of the human ingestion level; data from the whole fish are of more direct biological interest.

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 ABSTRACTER: M. F. Tripple

ELECTRON SPIN RESONANCE STUDIES OF SUCCINIC DEHYDROGENASE

DISCOLORED FLESH IN GREENLAND TURBOT

THE ROLE OF OCEANOGRAPHY IN DEVELOPING MARINE RESOURCES

PESTICIDE LEVELS IN PACIFIC NORTHWEST FISH

8.8 (Cross Reference: 1.69)

water during the winter months does not appear to undermine the freshness or keeping quality of the fish, more frequent lifting of the nets during the summer should be considered.

The discoloration results from seepage of blood or serum containing heme pigment from lysed red blood cells. The presence of blood pigments in the tissues may arise from bruises caused by struggling, being handled, or having veins constricted by the net filament. Discoloration was observed more frequently in small turbot than in larger fish. The problem might be partly alleviated by use of a larger mesh in gill nets, but this would reduce the size of the catch. Attempts to remove the pigment from discolored flesh by washing the flesh with cold water and treating it with chemical reagents were unsuccessful. Cooking for 1-2 min. in boiling water replaces the pink-brown color with a slightly more acceptable light yellow color. The incidence of discoloration is not only more frequent in small turbot, it is also more extensive in percent of fillet area affected.

The author feels that the most plausible solution to the problem is in the hands of the processor who could reject all turbot weighing less than 5 pounds. This would save a substantial portion of the labor cost wasted on unsaleable fillets. As a significant proportion of the gill net catches is composed of smaller fish, alternate uses for these fish will have to be found. Except for the loss of eye appeal, discolored flesh appears to be edible and wholesome. The author suggests using discolored turbot as dressed fish for salting and smoke curing or canning for the pet-food market.

8.59

Succinate can convert 50 percent or more of the enzyme to a radical form under anerobic conditions. Fumarate can repress the radical yield more effectively than oxaloacetate can. Malonate and methylfumarate enhance radical yield at low concentrations except when saturating amounts of succinate are present. Under aerobic conditions, succinate and fumarate are both necessary for a maximum radical yield of about 25 percent, and oxaloacetate is extremely effective in decreasing radical yield. Malonate represses radical concentration; however, its action appears generally to be biphasic. [13 references]

Neutral fat may be assembled from exogenous sources of fatty acids in the adipose tissue of Weddel seals as indicated by high activity of alpha-glycerophosphate dehydrogenase and low activity of glucose-6-phosphate dehydrogenase. The presence of low activity of glucose-6-phosphate dehydrogenase in other tissues prevents assignment of the function of fatty acid synthesis to any specific tissue and emphasizes the uniqueness of adipose mass in seals.

[Abstracter: M. M. Owin]

8.59 ALPHA-GLYCEROPHOSPHATE DEHYDROGENASE AND GLUCOSE-6-PHOSPHATE DEHYDROGENASE IN TISSUES OF THE WEDDEL SEAL

Fried, George H., Carleton Ray, Jack Hiller, Steve Rabinow, and William Antopol (Beth Israel Medical Center, New York; New York Aquarium, Brooklyn, New York; and Department of Biology, Brooklyn College, New York)
Science 155, No. 3769, 1560-1561 (March 24, 1967)

9.15

Pesticide residues in fish and shellfish

Fish sampled	Number of samples	Pesticide residue (p.p.m.) DDE	TDE	DDT
Anchovy	24	0.074	0.074	
	19	0.074	0.098	
	4	0.058-0.172	0.073-0.244	
Crab	1	0.039	0.011	---
	4	0.027-0.040	0.017-0.021	trace-0.013
English sole (fillets)	3	0.009-0.016	0.009-0.016	0.010-0.019
	1	0.053	0.071	0.058
Hake	10	0.058	0.047	0.090
	12	0.042	0.030	0.043
	11	0.038-0.083	0.030-0.090	0.065-0.147
	12	0.074	0.068	0.143
Ocean perch (fillets)	16	0.012	trace	0.013
Starry flounder (fillets)	1	0.018	0.026	0.013
True cod (fillets)	2	0.005-0.006	0.006-0.007	0.004
Yellowtail rockfish (fillets)	8	0.017	trace	0.004
	18	0.030	trace	0.014
	13	0.119	0.022	0.048
	14	0.092	0.028	0.036
Yellowtail rockfish (remains after removal of fillets)	8	0.042	0.006	0.021
	18	0.076	0.009	0.051
	13	0.256	0.055	0.104
	14	0.416	0.092	0.194

9.11

The role of oceanography in development of food resources will become increasingly important. Results of oceanographic surveys will provide the understanding of ocean processes needed for more efficient means of locating new resources. Followup programs will be directed at stock assessment, including determination of the effects of environmental change on the abundance and distribution of stocks. Oceanography will assist in locating new resources by providing information about the areas of high basic productivity that suggest possible large fishery resources.

After the stocks have been located, some manner of assessment is necessary. Assessment involves determination of substocks, maximum sustainable yield, and an understanding of the interaction of stocks with the environment. Understanding the relation between stocks and environment will lead to information vital for prediction of abundance and distribution of fish stocks. The author feels that in this respect oceanography may play its most important role. Ocean engineers will then have to help develop new harvesting techniques that will make U.S. fleets competitive with foreign fleets.

9.13 ADAPTATION TO SALT DEFICIENCY IN ANIMALS WITH DIFFERENT TYPES OF OSMOTIC REGULATION

Natochin, Yu. V. (Inst. Evolutionary Physiol. and Biochem., Leningrad, U.S.S.R.)
Chemical Abstracts 64, 11605a (April 11, 1966)

0.321 POST-MORTEM CHANGE OF HORSE MACKEREL MUSCLE PROTEINS
(*)

Maruyama, Yuji (Nichiro Fisheries Co., Ltd., Chuo-ku, Tokyo, Japan), and Taneko Suzuki

Bulletin of the Japanese Society of Scientific Fisheries 34, No. 5, 415-419 (May 1968) (Abstract and figures in English)

The postmortem changes of myofibrillar proteins and sarcoplasmic protein in horse mackerel were studied by means of solubility, viscosity, and salting-out curves. The horse mackerel was killed under narcosis and was stored in crushed ice. Ordinary muscle samples taken from three to five fish were combined and used in the preparation of extracts.

The solubility of proteins soluble in 0.6 M KCl and myosins was greater at the rigor stage than at the pre-α post-rigor stage. This confirmed findings in other fish. The amount of sarcoplasmic protein that was extractable with 0.005 M KCl decreased during storage.

It has been suggested that intrinsic viscosity of actomyosin of many pelagic fish decreases to 0.5–0.2 after death; however, in the case of horse mackerel the value decreased little by little.

The salting-out curves of myosins show that, at any stage, peaks of actomyosin or myosin and tropomyosin fractions appeared. The actin peak appeared only at rigor and post-rigor stages. [15 references] [Abstracter: M. F. Tripple]

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4.19 ON THE ORIGIN OF PRISTANE IN MARINE ORGANISMS
(*)

Avigan, Joel, and Max Blumer (Laboratory of Metabolism, National Heart Institute, National Institute of Health, Bethesda, Maryland 20014)

Journal of Lipid Research 9, No. 3, 350-352 (May 1968)

The saturated norditerpene, pristane, occurs in various geological sediments and crude oils; its presence has been considered evidence for a biological contribution to the formation of hydrocarbons in nature. A probable precursor of pristane is phytol, a monounsaturated diterpenyl alcohol, which occurs as an ester in chlorophyll and thus is ubiquitously present in the flora of past and present. Pristane has been found in many marine organisms, particularly in the basking shark (Cetorhinus maximus Gunnerus), whose liver lipids contain substantial amounts of pristane. This hydrocarbon has been found in relatively large quantity in copepods of the genus Calanus; these zooplanktonic organisms have been regarded as one of the primary sources of pristane in the marine biosphere. Pristane also occurs in trace amounts in marine algae, and it is present with phytane in terrestrial animals.

Phytol-U-^{14}C was adsorbed on algae and the algae were then ingested by two species of Calanus. The lipids of the copepods were analyzed after 48 hours and were found to contain radioactive pristane and radioactive phytanic acid. The conversion of phytol to pristane by the copepods is a likely biological source of pristane in nature. The results indicate that calanid copepods are capable of converting the phytol normally present in their phytoplankton diet to pristane. [12 references] [Abstracter: M. F. Tripple]

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1.0145 SOME ASPECTS OF SOVIET RESEARCH
(*)

Alverson, Dayton L. (Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Seattle, Washington 98102)

Commercial Fisheries Review 30, No. 1, 35-40 (January 1968) (Separate No. 805)
World Fishing 17, No. 6, 42 (June 1968)

Soviet fisheries research appears to be strongly directed toward understanding fish behavior so that fish can be more efficiently harvested and survival of fish populations and the productive capacity of the oceans improved. Soviet scientists are conducting research and evaluating the results from the standpoint of their application to improving Soviet fisheries. The scientists are studying sensory physiology with particular emphasis on understanding the sensory modalities involved in detecting various stimuli within the environment of the fish.

In investigating the behavior of cod and herring in the North Atlantic, the Soviet scientists found that they could drive midwater schools of fish down to within 2-3 meters of the seabed by using low-frequency sound. This finding implies a breakthrough in acoustical herding and could have an impact on the use of ocean resources. The idea is not to eliminate the behavior that leads to escape, but to increase the density of fish within the influence of a harvesting device. Herding, coupled with experiments to eliminate with electronarcosis behavior that leads to escape from harvesting devices, could greatly increase fishing efficiency. The Soviets claim to be using the world's largest crystals in their acoustical studies, particularly for the application of piezoelectrical effect to passive and active sound studies. [Abstracter: M. F. Tripple]

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4.90 NUTRITIONAL VALUE OF FISH OILS AS ANIMAL FEEDS
(*)

Karrick, Neva L. (Bureau of Commercial Fisheries Food Science Pioneer Research Laboratory, Seattle, Washington 98102)

Reprinted from Fish Oils, Chapter 24, pp. 362-382 (Avi Publishing Company, Westport, Connecticut [1967])

Circular 281, 21 pp. (December 1967) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20241)

Fish oils possess a broad spectrum of fatty acids that are well utilized by animals. When fish oils are used properly, they permit good growth, have high levels of metabolizable energy and of digestibility, and possess high contents of vitamins A and D. Oxidized fish oils with high peroxide values should not be fed to animals because of the detrimental effects of the peroxides. The vitamin E requirement of most animals is increased when fish oils are added to their diets. When the animals fed fish oils are to be used for food purposes, the amount of fish oil in the diet must be limited to prevent fishy flavors in the flesh. More research is needed to determine the role of fish oil in lipid metabolism and the interrelations with vitamins and amino acids and among the many fatty acids.

The author discusses fat-soluble vitamins, oxidation of fish oils, and fish oils in diets for poultry, swine, cattle, mink, and pets. [166 references] [Abstracter: M. F. Tripple]

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1.017 (Cross Reference: 1.87)

THE DISTRIBUTION OF SPINY LOBSTERS IN NEW ZEALAND WATERS (CRUSTACEA: DECAPODA: PALINURIDAE)

Kensler, Craig B. (Fisheries Research Division, Marine Department, Wellington, New Zealand)
Fisheries Research Division Publication No. 110, 9 pp. (1968)
Reprinted from the New Zealand Journal of Marine and Freshwater Research 1, No. 4, 412-420 (December 1967)

Two species of spiny lobsters or marine crayfish inhabit waters of New Zealand and offshore island territories: Jasus edwardsii (Hutton, 1875) and J. verreauxi (H. Milne Edwards, 1851).

J. edwardsii, the more common species, is found along most rocky coastlines in New Zealand, and is most abundant in the southwest of the South Island and at the Chatham Islands. This species apparently reaches its northern limit of distribution at the Three Kings Islands (34° S.) and its southern limit at the Auckland Islands (51° S.)

J. verreauxi, the less common species, is almost solely restricted to the northeast coast of the North Island. This species is uncommon in waters of the west and the south of the North Island and is rare in waters of the South Island. J. verreauxi apparently reaches its northern limit of distribution at the Kermadec Islands (31° S.) and its southern limit near Bluff (47° S.) on the South Island. [13 references] [Abstracter: M. F. Tripple]

0.321 PREFERENTIAL BINDING OF SOLVENT COMPONENTS TO PROTEINS IN MIXED WATER-ORGANIC SOLVENT SYSTEMS

Timasheff, Serge N., and Hideo Inoue (Pioneering Research Laboratory, U.S. Department of Agriculture)
Biochemistry 7, No. 7, 2501-2513 (July 1968)

The preferential interaction of lysozyme, bovine serum albumin, and insulin with one of the solvent components in mixtures of water and 2-chloroethanol was investigated using the method of differential refractometry with the application of the multicomponent theory. As the contents of chloroethanol in the mixture increased, the three proteins interacted preferentially. The first interaction was with 2-chloroethanol and then, after passing a maximum between 30 and 40 volume percent of chloroethanol, this interaction decreased and was followed by a change to preferential hydration at about 60 volume percent. This was similar to the interaction found with β-lactoglobulin.

The preferential interaction of β-lactoglobulin A with solvent components in mixtures of water with ethylene glycol and methoxyethanol was studied with the same technique. The effect was weaker in these solvents than in the 2-chloroethanol system. No significant excess binding of solvent components was detected below 30 volume percent in either system. The organic solvent became progressively preferentially bound at a solvent composition above 30 volume percent.

These results are compared with those of conformational transition studies carried out in the same systems. The results are discussed in terms of the affinities of different amino-acid residues for various types of media as the protein conformation is altered by a change in the composition of the media. [63 references] [Abstracter: M. F. Tripple]

4.90 MISCONCEPTIONS ABOUT NUTRITIONAL PROPERTIES OF FISH OILS

Stansby, M. E. (Bureau of Commercial Fisheries Food Science Pioneer Research Laboratory, Seattle, Washington 98102)
Reprinted from Fish Oils, Chapter 20, pp. 283-288 (Avi Publishing Company, Westport, Connecticut [1967])
Circular 280, 6 pp. (December 1967) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

The author's purpose in writing this report is to dispel certain possible misconceptions concerning the nutritional properties of fish oil. Fish oils contain a wider spectrum of fatty acids than do other sources of natural lipids. Just as ingested proteins require a good balance of essential amino acids for maximum nutritional value, in an analogous way, lipids should contain a good balance of fatty acids that serve some useful function. The present stage of knowledge is incomplete with respect to which of the many fatty acids actually perform useful functions under various states of normal and pathological conditions.

Some fatty acids, and not just those of the linoleic family, may perform these functions. For example, members of the linolenic acid family of fatty acids, which occur in considerable proportions in fish oils, support growth and markedly lower serum-cholesterol levels. On the other hand, the presence of highly polyunsaturated fatty acids in fish oils has raised questions as to whether potentially undesirable effects may occur. These effects stem from autoxidation, which leads both to the presence during oxidation of free radicals and to formation of certain oxidative intermediate and end products. Some of these ideas are examined in this report.

The author concludes that the oil in fish flesh used for human consumption does not cause adverse nutritional problems whether the fish are fresh or preserved. [Abstracter: M. F. Tripple]

4.7 PROCESS RELATING TO FISH LIVERS

British Patent 1,021,542
Abstracts from Current Scientific and Technical Literature 19, Abstract No. 1354, p. 249 (May 1967)

Fish livers or fish residues are hydrolyzed with alkali at 75°-100° C. for 5-40 min., oil is removed, and the hydrolyzed residue is acidified to pH <6.4 to precipitate protein. This process is claimed to give a high yield of high-quality oil and protein.

4.7 UTILIZATION OF SPERM WHALE OIL.
XII - PREPARATION OF EDIBLE OIL FROM SPERM WHALE OIL.
2. GLYCEROLYSIS OF SPERM WHALE OIL
AND MOLECULAR DISTILLATION OF MONOGLYCERIDES

Fujita, Takao, Ikuko Yanagisawa, and Mikio Mori (Central Res. Lab., Nippon Suisan Co., Tokyo, Japan)
Chemical Abstracts 67, No. 4, 12824t (July 24, 1967)

XIII - Preparation of alkyl dimethylamines from alkyl chlorides.--Mori, Mikio, and Takao Fujita Ibid. 12825u.

6.32
(*)

PHYTOCHROME IN RED ALGA, PORPHYRA TENERA

Dring, M. J. (Department of Botany, Westfield College, University of London, England)
Nature 215, No. 5108, 1411-1412 (September 23, 1967)

The marked stimulation of spore formation in the conchocelis phase of the red alga Porphyra tenera Kejllmn. by short-day conditions was reported by Kurogi in 1959. The ability of a short light interruption in the middle of a long dark period to simulate long-day conditions has been shown by Dring (1967), who concluded that the response was a genuine photoperiodic response of the type common among flowering plants. In an attempt to identify the pigment that mediates this photoperiodic response, the author determined a rough action spectrum for the inhibition of the reproductive response by short light breaks. The action spectrum that was obtained for the short-day photoperiodic response of Porphyra showed a peak in the red region of the spectrum, and the effects of red are completely reversed by subsequent far-red treatment. The results clearly showed that phytochrome was involved in the photoperiodic response and that this pigment occurred in Porphyra. [10 references] [Abstracter: M. F. Tripple]

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6.32 LOW-MOLECULAR-WEIGHT COMPOUNDS IN MACROCYSTIS PYRIFERA, A MARINE ALGA

Chemical Abstracts 66, No. 13, 52913g (March 27, 1967)
Schweiger, Richard G. (Kelco Co., San Diego, California)

7.594
(*)

KOMBINATION VON GASCHROMATOGRAPHIE UND DÜNNSCHICHTCHROMATOGRAPHIE BEI STEROID-UNDERSUCHUNGEN [COMBINATION OF GAS CHROMATOGRAPHY AND THIN-LAYER CHROMATOGRAPHY IN STEROID RESEARCH]

Curtius, H.-Ch., and M. Müller (Chemisches Laboratorium der Universitäts-Kinderklinik, Zürich, Switzerland)
Journal of Chromatography 32, No. 2, 222-229 (January 23, 1968)

Gas and thin-layer chromatography are combined in an automatic and continuous operation for use in the investigation of steroids. The components eluted from the separation column are adsorbed in sequence on the start line of the thin-layer plate, which rests on a carriage propelled by an adjustable-speed motor. The trimethylsilyl ethers of the steroids are split by spraying the start line with hydrochloric acid and methanol; then the thin-layer chromatography is carried out. A list of spray reagents suitable for the detection of the free steroids on the thin-layer plate is included in this article.
[Abstracter: M. F. Tripple]

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7.594 STRUCTURAL ANALYSIS OF LECITHINS BY THIN-LAYER CHROMATOGRAPHY

Chemical Abstracts 66, No. 11, 44155w (March 13, 1967)
Dyatlovitskaya, E. V., V. I. Volkova, and L. D. Bergelson (Inst. Chem. Natl. Products, Moscow, U.S.S.R.)

7.45
(*)

COLORIMETRIC DETERMINATION OF INORGANIC PHOSPHATE IN THE PRESENCE OF BIOLOGICAL MATERIAL AND ADENOSINE TRIPHOSPHATE

Stanton, Martin G. (Gatty Marine Laboratory, St. Andrews, The University, Fife, Scotland)
Analytical Biochemistry 22, No. 1, 27-34 (January 1968)

Since its introduction in 1925, the colorimetric estimation of inorganic phosphate by the method of Fiske and SubbaRow has been widely used. This method has the advantage that it will detect inorganic phosphate in the presence of other compounds containing phosphorus, such as the nucleotide polyphosphates, so that no prior separation procedures are necessary. In addition, the use of reducing agents, such as 1,2,4-aminonaphtholsulfonic acid, has proved to be quite reliable. However, this quantitative method suffers from a number of disadvantages. This paper examines these disadvantages and presents a modified method that overcomes them.

The method proposed by the author uses the same reagents as the method of Fiske and SubbaRow, but it differs in the means of obtaining the final result. The proposed method has the advantages of simplicity of handling and minimal requirements of apparatus. No transfer of liquids is needed when the method is used in enzyme studies. The incubation of the enzyme with substrate is carried out in the same 10-ml. graduated tube in which the final blue color is developed.
[Abstracter: M. F. Tripple]

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DETECTION OF BOTULINAL TOXINS BY IMMUNODIFFUSIONS

Vermilyea, Barry L., Homer W. Walker, and John C. Ayres (Department of Dairy and Food Industry, Iowa State University, Ames 50010)
Applied Microbiology 16, No. 1, 21-24 (January 1968)

Botulinal toxins are simple proteins and can be shown in vitro by immunological procedures. A hemagglutination procedure sensitive enough to detect one LD50 mouse unit (lethal to 50 percent of the animals tested) of botulinal toxin has been reported by Johnson et al. (1966). Immunodiffusion methods to detect small quantities of proteinaceous toxins, such as staphylococcal enterotoxins, in foods have been reported by Casman and Bennett (1965) and by Read et al. (1965). The authors of the present paper attempted to adapt the gel-diffusion technique to the detection of botulinal toxins in foods.

The procedure uses concentration with Sephadex and analysis by gel diffusion to detect toxins of Clostridium botulinum in foods. Botulinal toxins with toxic levels of 370 to 557 LD_{50} mouse units per milliliter can be detected in food samples. Test results were verified by comparison with results from the mouse protection test. About 24 hours are necessary to complete the entire procedure. [11 references] [Abstracter: M. F. Tripple]

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7.80 POLAROGRAPHIC DETERMINATION OF DIMETHYLNITROSAMINE IN FISH PRODUCTS

Chemical Abstracts 67, No. 21, 99021a (November 20, 1967)
Lydersen, Dagfin L., and Kalman Nagy (Norges Tek. Hogskol., Trondheim, Norway)

7.42 IMPROVED SENSITIVITY AND SELECTIVITY IN THE SPECTROPHOTOMETRIC DETERMINATION OF IRON BY USE OF A NEW FERROIN-TYPE REAGENT

Schilt, Alfred A., and William C. Hoyle (Department of Chemistry, Northern Illinois University, De Kalb, Illinois)
Analytical Chemistry 39, No. 1, 114-119 (January 1967)

The compound 3-(4-phenyl-2-pyridyl)-5,6-diphenyl-1,2,4-triazine (PPDT) was included in a group of compounds investigated for their chromogenic properties with Cu^{+}, Co^{+2}, and Fe^{+2} ions. PPDT proved to be especially sensitive as an iron chromogen, imparting a molar absorptivity to its iron(II) complex of 28,700 at 561 mμ. PPDT was more sensitive than 2,4,6-tripyridyl-1,3,5-triazine (TPTZ) but was less sensitive than 2,6-bis(4-phenyl-2-pyridyl)-4-phenylpyridine. It was found to give a more stable and more extractable iron(II) complex than either of the other reagents. [8 references] [Abstracter: M. F. Tripple]

7.42 MAGNESIUM IONS: ACTIVITY IN SEAWATER

Pytkowicz, R. M., I. W. Duedall, and D. N. Connors (Department of Oceanography, Oregon State University, Corvallis 97331)
Science 152, 640-642 (April 29, 1966)

The activity of magnesium ions in sea water was determined from solubility data. The activity was found to be between the values determined by Platford (1965) and by Garrels and Thompson (1962). The value obtained may result from extensive formation of magnesium sulfate ion pairs.
[Abstracter: M. F. Tripple]

7.84 (Cross Reference: 1.86)
DETECTION AND DIFFERENTIATION OF COD MEAT SUBSTITUTED FOR CRABMEAT IN FROZEN CRAB PRODUCTS

Freeman, C. C. (Food and Drug Administration, 423 Canal Street, New Orleans, Louisiana 70130)
Journal of the Association of Official Analytical Chemists 51, No. 3, 509-512 (May 1968)

Macroscopic examination can be used to detect the adulteration of frozen crab products with cod meat. Cod meat held in the path of a focused beam of light forms a brilliant display of colored patterns. Crab meat examined in the same way does not show the colored patterns. Cooking the products does not alter this phenomenon. Preliminary investigation indicated that fish in general possess the same refractive ability as cod to form the color patterns, whereas shellfish, in general, do not. [Abstracter: M. F. Tripple]

7.82 VOLATILE ACIDS IN CANNED FISH PRODUCTS AS AN INDEX OF QUALITY

Wierzchowski, Jozef, and Regina Gałewska (Akad. Med., Gdansk, Poland)
Chemical Abstracts 64, No. 12, 18311d (June 6, 1966)

7.81 VOLATILE BASES IN FRIED FISH

Pearson, D. (Univ. Reading, England)
Chemical Abstracts 68, No. 1, 2064b (January 1, 1968)

6.36 CAN ALGAE UTILIZE METHANE?

Anonymous
Nature 215, No. 5096, 7-8 (July 1, 1967)

The use of microbes in the production of edible yeast was given new direction by the results of a recent study into the growth of photosynthetic sulfur bacteria in different gaseous environments. The researcher found that adding high-quality methane to the carbonate medium upon which Chlorella was growing enhanced the alga's growth by from 35 to 45 percent. Since algae excrete various metabolites that tend to inhibit the growth of methane-oxidizing bacteria, and since algae growing in an atmosphere of 100 percent methane will produce free oxygen, it is reasonable to assume that they will assimilate the methane. One of the applications suggested for such a methane-assimilating system is for gas exchange in closed environments where oxygen enrichment is needed.
[Abstracter: L. Baldwin]

6.32 THE STEROLS OF SOME MARINE RED ALGAE

Gibbons, G. F., L. J. Goad, and T. W. Goodwin (Univ. Coll. Wales, Aberystwyth, Wales)
Chemical Abstracts 67, No. 5, 18567h (July 31, 1967)

7.599 POLYCYCLIC AROMATIC HYDROCARBONS IN SOLVENTS USED IN EXTRACTION OF EDIBLE OILS

Howard, John W., Thomas Fazio, and Richard H. White (Division of Food Chemistry, Bureau of Science, Food and Drug Administration, Washington, D.C. 20204)
Journal of Agricultural and Food Chemistry 16, No. 1, 72-76 (January-February 1968)

A method was developed for the isolation and determination of polycyclic aromatic hydrocarbons in commercial hexanes used in the solvent extraction of edible oils. The hydrocarbons were isolated by partition, column, and thin-layer chromatographic techniques, and they were measured by ultraviolet and spectrophotofluorometric procedures. Benzo[a]pyrene, dibenz[a,h]anthracene, benz[a]anthracene, and benzo[g,h,i]perylene were added to 500 grams of hexane solvents at levels of 2 p.p.b. The average recoveries of these hydrocarbons ranged from 86 to 95 percent. Trace amounts of pyrene, fluoranthene, anthracene, phenanthrene, and various substituted phenanthrenes were isolated from 9 of the 15 solvents examined. No known carcinogenic hydrocarbons were detected by this method. [10 references] [Abstracter: M. F. Tripple]

7.599 A COLORIMETRIC METHOD FOR THE QUANTITATIVE DETERMINATION OF SUGAR IN PRESERVED FISH (ANCHOVIES AND MARINATED)

Mueller, K. H. (Lysell G.m.b.H., Hamburg, Germany)
Chemical Abstracts 66, No. 3, 10027u (January 16, 1967)

7.599 PAPER CHROMATOGRAPHIC DETECTION OF 2-DEOXY SUGARS

Weidemann, Gerhard, and Werner Fischer
Chemical Abstracts 66, No. 3, 8718g (January 16, 1967)

8.8 FOOD QUALITY CONTROL

(*)
Goldenberg, N. (Food Group, Marks and Spencer Ltd., England)
Food Manufacture 43, No. 1, 29-34 (January 1968)

Quality control in the food industry can be broadly divided into a number of interrelated basic components. This concluding article in a series on quality control discusses the following basic factors.

1. Conception and elaboration of quality standards to be strived for, such as quality, texture, flavor, color, and appearance. This part of quality control is a function of top management.

2. Use of the right raw materials, which includes buying of raw materials, examination and analysis of materials, specifications for raw materials, and handling of perishable raw materials.

3. Use of the right processing methods and process control.

4. Standards of safety to ensure that the foods produced are safe to eat.

5. Production of food under clean and hygienic conditions.

6. Examination of the final product, which is inspection control.

7. Packaging and presentation of the final product, which encompasses standards for films.

8. Handling of the product from factory to retailer.

[Abstracter: M. F. Tripple]

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9.11 COMPUTERIZED LIBRARY OF DEEP SEA SOUNDINGS

(*)
Dishon, Menachem (The Weizmann Institute of Science, Rehovoth, Israel), and Bruce C. Heezen (Lamont Geological Observatory and Columbia University, New York, New York)
Nature 215, No. 5109, 1439-1441 (September 30, 1967)

Over 1 million deep-sea depth soundings taken from more than 8,000 track segments originally plotted on more than 2,000 source sheets have been gathered in a computerized library. The basic source information for the soundings comes from master plotting sheets maintained by the U.S. Naval Oceanographic Office; the Lamont Geological Observatory; and the hydrographic departments of the United Kingdom, South Africa, Australia, New Zealand, the Netherlands, and Germany. With every individual sounding-track segment is a location plot, lists of latitude-longitude coordinates, depth values and units, and other source and technical data. Vertical profiles at an exaggeration of 100:1 have been prepared for over 2 million miles of these sounding tracks. The assembled data will be used to make a model ocean from which average ocean depths can be numerically computed on a worldwide basis. [5 references] [Abstracter: L. Baldwin]

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9.13 METABOLISM OF PYRUVATE IN TESTES OF FISH AND RABBITS WITH PARTICULAR REFERENCE TO P-NITROPHENOL AND 2,4-DINITROPHENOL

(*)
Mounib, M. S. (Fisheries Research Board of Canada, Halifax Laboratory, Endocrinology Section, Halifax, Nova Scotia)
Comparative Biochemistry and Physiology 22, pp. 539-548 (1967) (Pergamon Press, England)

Pyruvate undergoes reduction to lactate, oxidative decarboxylation, and fixation with carbon dioxide in the testes of fish and rabbits. The oxidative decarboxylation of pyruvate and the carbon dioxide fixation with pyruvate may play a role in regulating the metabolism in the testis. All carbons of pyruvate could incorporate into lipids, proteins, and nucleic acids in the testicular tissue of cod. The testicular tissue of fish and rabbit responded differently to nitrophenols at a concentration of 10^{-4} M. The oxidative metabolism was suppressed in the two species at a concentration of $2\text{-}4 \times 10^{-4}$ M. [23 references]

[Abstracter: M. F. Tripple]

*Items on back of card.

9.13 FAT METABOLISM IN FISH

Tashima, L., and George F. Cahill, Jr. (Harvard Med. School, Boston, Massachusetts)
Chemical Abstracts 67, No. 5, 18840s (July 31, 1967)

9.13 THE SODIUM, POTASSIUM, AND WATER CONTENT OF THE FLESH OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) IN RELATION TO SEXUAL DEVELOPMENT AND STARVATION

(*)
Tomlinson, N., J. R. McBride, and S. E. Geiger (Fisheries Research Board of Canada Vancouver Laboratory, Vancouver, British Columbia)
Journal of the Fisheries Research Board of Canada 24, No. 2, 243-248 (February 1967)

The authors studied the influence of feeding on the changes that occur in the skeletal muscle content of sodium, potassium, and water in sockeye salmon (Oncorhynchus nerka) during sexual development and spawning. They found that feeding had little if any effect on the changes in the content of skeletal muscle. The authors concluded that the period of starvation that salmon undergo during their spawning migration under natural conditions is not the major cause of the degeneration of their skeletal muscle, but rather that the changes are associated in some manner with the development of the gonads, presumably through the action of hormones. [21 references] [Abstracter: M. M. Gwin]

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9.13 RELATION BETWEEN THE MATURATION OF FISH OVARY AND PANTOTHENIC ACID

Teshima, Shinichi, Akio Kanazawa, and Kenichi Kashiwada (Kagoshima Univ., Kagoshima, Japan)
Chemical Abstracts 67, No. 1, 1094d (July 3, 1967)

9.15 RESIDUAL COMPONENTS FROM AGRICULTURAL CHEMICALS IN FOODS. V - MERCURY CONTENTS IN RICE AND OTHER FOODS

Furutani, Sadaji, and Yutaka Osajima (Kyushu Univ., Fukuoka, Japan)
Chemical Abstracts 67, No. 11, 52787q (September 11, 1967)

9.11 ECOLOGICAL STUDIES DURING PROJECT SEALAB II

Clarke, Thomas A., Arthur O. Flechsig, and Richard W. Grigg (Scripps Institution of Oceanography, University of California, San Diego, at La Jolla)
Science 157, No. 3795, 1381-1389 (September 22, 1967)

Sealab II, an underwater habitat, was placed at a depth of 61 m. about 1,400 m. off the coast of Southern California for 45 days, during which time three 10-man teams lived on the ocean bottom for about 2 weeks each. The authors of this article participated in the project as divers, and their observations cover the entire period the Sealab II was on the bottom. During this time, they studied the ecology of the sand bottom around the resting site and observed on a day-by-day basis the organisms attracted to the site. Abundances, behavior, and food habits were recorded. Although most of the observations were of areas adjacent to Sealab II, the authors were also able to make several surveys of the sand bottom at locations removed from the site. This allowed comparison of the fauna attracted to Sealab II with the normal sand-bottom community. The authors believe this to be the first opportunity to conduct a continuous underwater study of marine organisms. [13 references] [Abstracter: M. F. Tripple]

9.12 ROLE OF PTERIDINES IN THE PIGMENTATION OF CHROMATOPHORES IN CYPRINID FISH

Matsumoto, Jiro (Keio Univ., Yokohama, Japan)
Chemical Abstracts 64, 3997a (January 31, 1966)

9.13 BLOOD LACTIC ACID CONCENTRATION IN BLACK BULLHEADS, ICTALURUS MELAS, AFTER TRANSPORTATION AND FORCED EXERCISE

Caillouet, C. W., Jr. (Institute of Marine Sciences, University of Miami, Miami, Florida 33149)
Iowa State Journal of Science 42, No. 1, 1-7 (August 1967) (Iowa State University, Ames)

Observations on blood lactic acid concentrations of bullheads after transportation and after starvation and exercise are reported. Black bullheads (Ictalurus melas) were transported 2.5 hr. in a nonaerated live tank with about 0.4 pounds of fish per gallon of water. In the laboratory, the fish were transferred to a 60-gallon tank containing aerated water at 20° C. The blood lactic acid concentration averaged 18.5 milligrams per 100 milliliters of whole blood at 0.8 to 1.4 hr. after transportation; the concentration dropped to 9.2 mg. per 100 ml. after 2.8 to 3.4 hr. There were no further significant changes in lactic acid concentration during the following 34 hr.

The bullheads were starved for 52 days and were then subjected to 17 min. of forced exercise. The mean blood lactic acid concentration of unexercised fish was 5.5 mg. per 100 ml.; the concentration of exercised fish increased significantly to 42.3 mg. per 100 ml. at 0.6 hr. after exercise. By 4.2 to 4.9 hr. after exercise, the mean blood lactic acid concentration had returned to near the level of that in unexercised fish. [Abstracter: M. F. Tripple]

8.8 CONTENTS OF INDOLE IN CANNED FISH AND SHELLFISH ON THE MARKET

Choe, Chun Eon, and Eung Ho Lee (Army Res. Lab., Seoul, Korea)
Chemical Abstracts 65, 7903e (August 29, 1966)

8.8 THE USE OF INOSINIC AND GUANYLIC ACIDS (SODIUM AND CALCIUM SALTS) IN HUMAN FOOD

Penau, Henri
Chemical Abstracts 66, No. 19, 84802m (May 9, 1967)

8.6 THE VITAMIN CONTENT OF MEAT AND FISH PRESERVES

Schilling, A., and G. Zimmermann (Deut. Forschungsanstalt Lebensmittel Chem., Munich, Germany)
Chemical Abstracts 64, 10320e (March 28, 1966)

8.8 AROMA OF DRIED BONITO (KATSUOBUSHI). I - NEUTRAL COMPOUNDS

Yamanishi, Tei, Akio Kobayashi, Noriko Nakayama, and Yoko Nakasone (Ochanomizu Univ., Tokyo, Japan)
Chemical Abstracts 65, 19220c (December 5, 1966)

9.13 CCCURRENCE OF A DIHYDROXY-ε-CAROTENE IN A FISH

Crozier, George F., and Donald W. Wilkie (Univ. of California, San Diego)
Chemical Abstracts 65, 11014e (September 26, 1966)

9.13 FAT METABOLISM IN FRESHWATER FISHES. THE SYMPHATHETIC NERVOUS SYSTEM AND THE MOBILIZATION OF FATTY ACIDS

Farkas, Tibor (Hung. Acad. Sci., Tihany, Hungary)
Chemical Abstracts 68, No. 23, 10295q (June 3, 1968)

9.13 METABOLISM OF PYRUVATE BY THE OVARIAN TISSUE OF COD

Mounib, M. S. (Fisheries Research Board of Canada, Halifax Laboratory, Endocrinology Section, Halifax, Nova Scotia)
Experimental Cell Research 46, pp. 610-612 (1967)

Previous work by the author (1967) showed that, when pyruvate is added to the incubation medium of the testicular tissue of cod or rabbit, it undergoes reduction to lactate and oxidative decarboxylation. The stoichiometry of the reaction, however, did not follow the dismutation equation of Krebs and Johnson in which 2 pyruvate + H_2O → lactate + 1 acetate + 1 carbon dioxide. The evidence from the prior experiment was in support of a carbon dioxide fixation with pyruvate in the testicular tissue. This report presents evidence that the ovarian tissue of cod metabolizes pyruvate via essentially the same routes. Both oxidative decarboxylation and carbon dioxide fixation of pyruvate appear to play important roles in regulating the metabolism of the ovary. [11 references]
[Abstracter: M. F. Tripple]

OCEANOGRAPHY
ICHTHYOLOGY

QUALITY CONTROL
VITAMIN COMPOSITION

BIOCHEMISTRY AND METABOLISM OF FISH

BIOCHEMISTRY AND METABOLISM OF FISH

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